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Pleistocene Reborn

Prehistoric beasts feature of Los Angeles Park

By HULBERT BURROUGHS

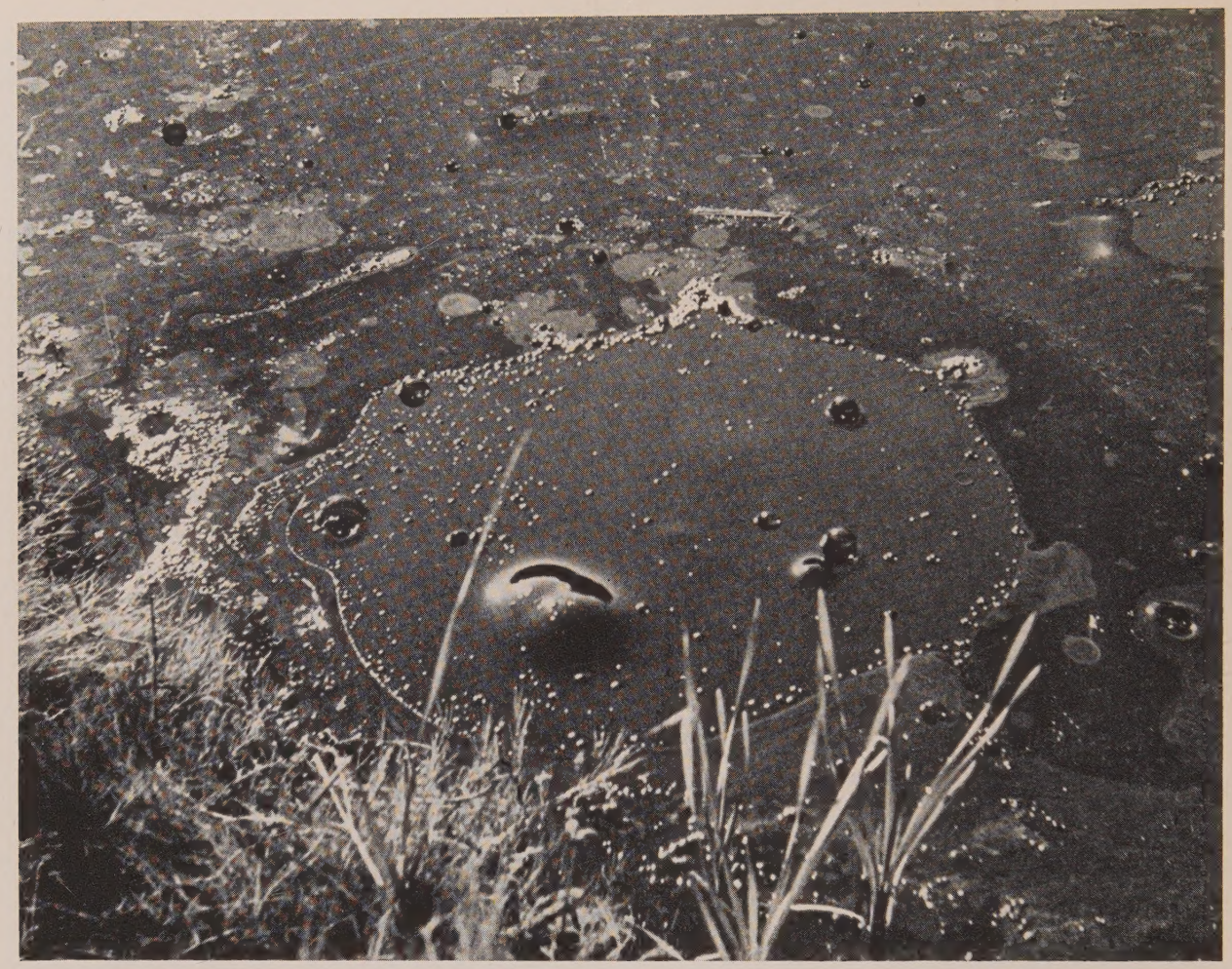
Photographs by the Author

A HUNDRED thousand years ago a formidable array of wild animal life roamed over the plains and hills of North America. Eons before the first recorded history of man, great imperial elephants and mastodons lumbered across the American landscape. Vicious sabre-tooth cats (commonly referred to as "tigers") fought among themselves and preyed upon primitive bisons, camels and horses. Grotesque giant ground sloths ambled ponderously about. Then it was that the great American lion held full sway as the king of beasts, the greatest of all hunters in an age notable for its mighty beasts.

The story of that Pleistocene era might well have remained one of the lost pages in the history of life on our planet if certain great depositories of fossils had not been discovered. Among the most famous of these were the La Brea asphalt pits near Los Angeles, where Nature provided a remarkable treasure vault wherein to preserve for all time an important chapter of that fascinating story. There, in "The Death Trap of the Ages", have accumulated a greater number and assortment of animal re-

THE SABRE-TOOTH TIGER PROBABLY RANKED NEXT TO THE GREAT LION AS A FIGHTER IN THE DAYS WHEN OTHER GREAT ANIMALS ROAMED AMERICA

EQUIPPED WITH POWERFUL CLAWS TO HOLD ITS PREY, THIS BEAST HAD TWO NINE-INCH SABRE-LIKE CANINE TEETH WITH WHICH TO STAB ITS VICTIMS

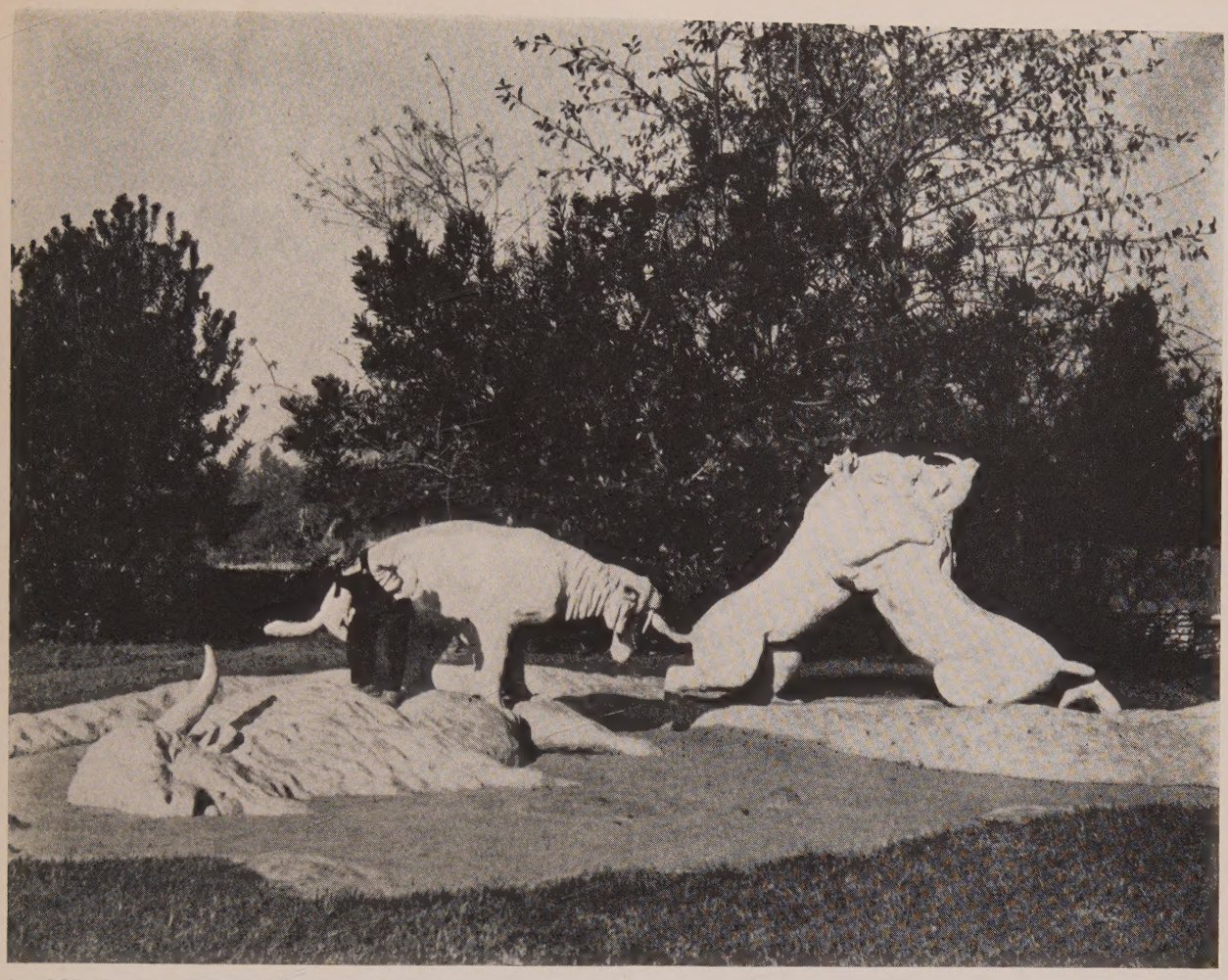


BUBBLES OF GAS STILL RISE AND BURST ON THE STICKY SURFACE OF THE LA BREA PITS

THE SHORT-FACED BEAR, RIVALLING THE EXISTING BEARS OF ALASKA, WAS THE LARGEST CARNIVORE FOUND IN THE LA BREA PITS. HERMAN T. BECK, SCULPTOR OF THIS STATUE

mains from Pleistocene times than probably in all other localities in the world combined. From the depths of the sticky tar that perfectly preserved them have been recovered the bones of such prehistoric animals as the imperial elephant and mastodon, the great American lion and the sabre-tooth tiger, the short-faced bear and the dire wolf, camels, horses, primitive oxen and bisons, giant ground sloths, and many other lesser forms.

Although world-famous among scientists, the story of the La Brea pits is not generally known to the layman. To give the public a vivid material picture of that long-gone age, the Los Angeles Museum has converted the pit area into a public reservation called Hancock Park; and has undertaken to make life-sized reconstructions of the various animals found imbedded there.

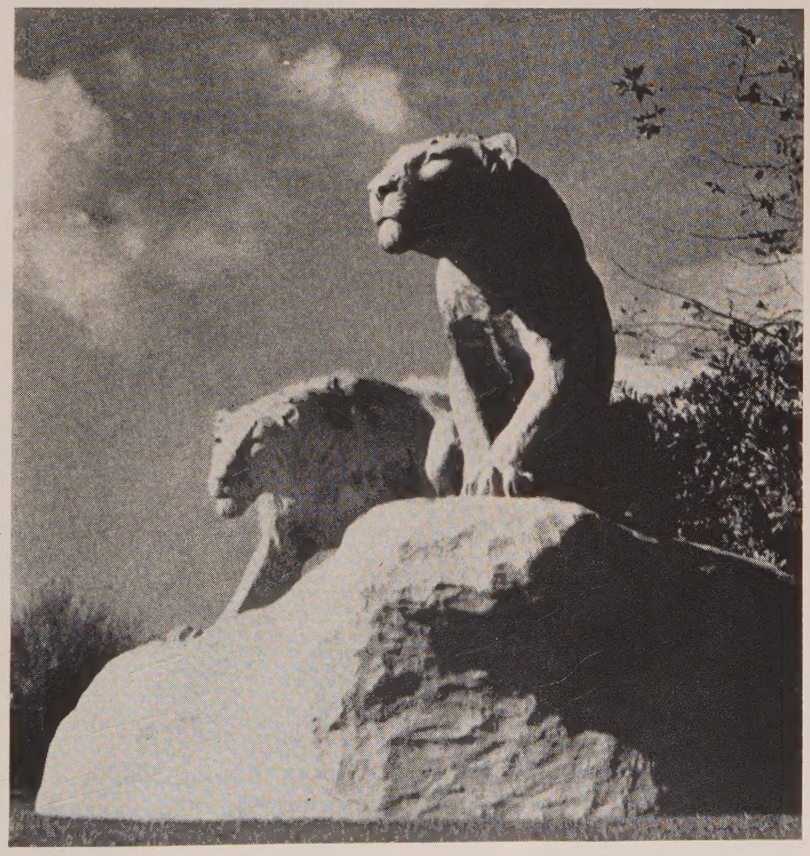


A SCENE OF THE PAST—PRIMITIVE BISON CAUGHT IN A POOL, WITH SABRE-TOOTHS FIGHTING FOR IT

THE GREAT AMERICAN LION, TRUE KING OF BEASTS OF PLEISTOCENE DAYS. SCULPTURES, RESPECTIVELY, BY R. L. ROOP AND HERMAN T. BECK, BOTH OF LOS ANGELES MUSEUM

Today visitors to this unique park may see for themselves the actual tar pools in which, ages ago, the mighty beasts of the past became mired. There bubbles of gas still rise and burst on the surface of the sticky asphalt as they have done since Pleistocene times. And near the pools will soon be life-sized models of each of these great beasts.

Thus far the Los Angeles Museum has reconstructed in cement and plaster four different groups of animals. Perhaps most impressive and appealing to the imagination is the fine reconstruction of the short-faced bear. Rivalling or even exceeding in size the great brown and Kadiak bears of present day Alaska, this huge creature was the largest carnivore found in the La Brea pits. To look at the sculpturing of this huge fellow is to imagine meeting him face to face, armed with no more than



the primitive club or a rock, the weapons of an earlier day.

Unique in the feline world were the sabre-tooth tigers of the Pleistocene. The predominant characteristic of these powerfully-muscled cats was their tremendously developed upper canine teeth, which often grew to a length of nine or ten inches. With these sharp "sabres" they probably killed their prey with repeated stabs in some vital spot. Admirably represented in the park is a life-sized group of three of these animals.

Recently completed is a group of Mylodont ground sloths similar to those whose remains were found in the Rampart Caves of the lower Colorado River and in the Gypsum Caves of Nevada. These clumsy ponderous creatures must have weighed at least three tons. The modern two-toed and three-toed sloths of South America are but midget descendants of these earlier monstrous forms.

The group of great American lions is splendidly executed. These superb animals were similar in form to the African lion of today, but were at least a fourth larger than either the modern lion or the Asiatic tiger. Next to the short-faced bear, it was the largest carnivore found in the La Brea pits. Strong-muscled and agile, he was undoubtedly the greatest hunter of the age.

Eventually the Los Angeles Museum will construct life-sized examples of every important animal whose remains were found in the pits. In the not distant future visitors may walk among a "reincarnated" fauna of the past, and imagine the struggles of early man in a world of such beasts.

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Decorated

By OSCAR OSTLUND

To him who hunts
For beauty in the forest,
Nature is obliging.

Yesterday . . . a root-made-man,
In form, a Continental musketeer,
Was lying in the woods, undressed.

I took the soldier home,
And today . . . a garment
Spangles on his chest;
A spider wove around the volunteer—
A silky vest.

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The Western Mocking Bird *By* SAM *and* GLADYS KNIGHT

IN THE semi-arid, mountainous section of south central Arizona the western mocking bird appears during the summer months. They mate there and raise their families, disappearing from the neighborhood soon after the babies mature. They probably winter farther south in the lower altitudes of southern Arizona and northern Mexico, although we have reports that a few have been seen at that season within a mile or two of our home in Christmas. Not many of them appear in any given year but we can depend upon seeing a few, and hearing them. It is needless to describe the beauty and infinite variety of their song. The mocking bird stands unrivaled in mimicry and originality.

They are not particularly shy, but are not attracted by any food we can offer. However, a small pool constantly fed by fresh water serves for a daily bath, and the bird pictured here showed his appreciation by striking a singing pose and holding it until the photograph was taken. In this case, the camera was set about four feet from the pool. A long release was held by the photographer, who waited quietly behind a clump of shrubbery for the proper moment. Mocking birds love to dominate a supply of food and water.

"THE FEATHERED GALLANT BATHED UNCEREMONIOUSLY, TOSSING SHINING DROPLETS ALL ABOUT."

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BLACK, GOLD and CRIMSON

By JOHN LINDSEY BLACKFORD

Illustrated by R. Bruce Horsfall

THE sun shone in a sky intensely blue and cloudless. In the open pine woods of the flat under a hot sun, as I tramped across the benches to the foothills, I felt increasingly that inexpressible drowsiness and peace of midsummer creeping upon me. It was in that time following upon mid-June when come our first brilliant summer days.

I wandered on, treading the dry needle and cone strewn floor of this stately yellow pine forest. The shimmering heatwaves were devil-dancing upon the flat, and one could feel their pulsating radiance in all the air about.

Here, on the north side of the river, broad flats, stream terraced, rise in stairstep fashion from the wide winding waterway back to the green-clad mountains.

Approaching the second of these long hills or bench fronts, the open pinelands terminate abruptly upon a wall of birch, bordered with aspen and flanked here and there by clumps of fir. How welcome the dense greenery is to sun-tired eyes, drawing one's footsteps toward it.

From the tipmost candle of a young yellow pine flashed brightly a mountain bluebird. He is the Blueboy of birdland, this vagrant bit of the cerulean sky.

I stood now upon the border of the deep wood, an association of mixed broad-leaf and conifers, damp and umbrageous. From its depths at the first light comes the dawn chorus, a silver web of bird song. By eleven of the clock the morning roundelay too was over, although there came at intervals the notes of the wood pewee, so ennuye, the peremptory yet liquid "sweetheart, come here," of Cassin's vireo, and the ringing "three cheers" of the olive-sided flycatcher, while a song of constant beauty, like an edging of fine lace, was woven through and about the whole—the song of the red-eyed vireo, the sweet singer of summertime.

A few steps and one is under this verdant canopy brushing through fern, osier and thimbleberry, shaded by black birch and willow, while towering above stand spruce and fir, and the tall western tamaracks, greatest of all the larches.

Almost instantly, within the distance of a few paces, may be felt the cooling breath of the heavy forest, rapidly resuscitating one from the stupefying heat-weariness.

Pressing forward, one finds that the steep slope of the long hill, as well as its foot, is swathed with a dense bower of deciduous greenery. All this luxury of leafage is explained by the presence of a water-carrying layer of the bedrock, an aquifer, out-cropping up there along the

"PRESENTLY HE WAS JOINED BY HIS QUIET, INCONSPICUOUS MATE."

brow of the hill, evincing itself by a line of springs. They are clear and cold, and come laughing and splashing down to the flat to creep away among the roots and through the leaf-mould, quenching the thirst of the loose soil, and blessing the hill and the adjoining lower levels with a wealth of foliage.

Lying outstretched upon mossy stones, I had drunk thirstily from a spring rivulet, immersing my face in the cooling flow of the little stream, and then, seated upon a log, cushioned also with moss, was luxuriating in the dreamy restfulness of the place. My mind had half fled the present when with meteoric flight a tanager came to perch not far above me. In plumage as dazzling as the summer sunshine he sat there, this western tanager, the Prince Charming of our western woodlands. And though he must have at once discovered me, he was possessed of perfect poise, while I, despite the fact that mine was a long acquaintance with tanagers, marveled anew.

How delightful this miracle of color could be, interesting himself so sedulously in the ripening rose-purple service-berries, displaying to advantage in light and shadow his showy plumage, the vivid black, the bright yellow and the crimson red.

If we may yet on occasion indulge ourselves with belief in old legends that tell of gods in form of beast or bird, we know that in the tanager we see indeed the avatar of some bright deity.

The male of this mountain and Pacific coast species is the acme of feathered elegance. Returning northward in spring migration from central and southern Mexico and the highlands south to Costa Rica, he lends a note of tropical and exotic brilliance to the forests of western North America.

The purple fruits were few, and presently my tanager dropped to a lower branch. There with surprising unconcern, not unmixed with quiet curiosity, he approached even closer down its slender swaying tip.

Such a gorgeous combination he was of crimson, gold and black! The blood red of his head shaded posteriorly into the rich yellow of neck and underparts. Yellow, too, was laid upon the rump and upper tail-coverts and in lighter hues margined or colored the wing-coverts. Wings, shoulders, back and tail were pure black. The bill was waxen yellow.

Presently he was joined by his quiet inconspicuous mate. Gracefully she moved down a twig nearer to the ripening fruit, this demure lady attired in olive-green and olive-yellow. Her back was tinged with gray, the wings were grayish-dusky, and the tail gray-brown edged with yellowish-green. Occasionally in her descent she paused to pick the berries that pleased her fancy.

Soon the pair darted upward into an evergreen whence came his *"pitic, pitic, pititic."*

I recall another morning when, early with a companion, I was clearing the bed of a spring branch that flowed through a small ravine. The larger trees had been cut here and the heavy timber stood back at some distance. On the intervening space there grew an occasional moun-

tain maple and, nearer the streamlet, clumps of the pale elderberry. Over us leaned a birch, its waxy leaves glistening in the morning sunshine. Above us and but two yards along the little stream was a silvery pool, clear and crystalline, that mirrored the infrequent, filmy clouds.

Suddenly there dropped to the edge of the limpid water a bird in colors as brilliant as the morning; startling he would be even to those accustomed to Nature's wonders. It was a male tanager, this animate jewel that appeared at the shimmering pool before us.

Quite unmindful of two spectators who stood motionless to watch, the feathered gallant bathed unceremoniously, tossing the shining droplets all about. Hopping to a wet stone that broke the surface near the edge, he perched there for a brief interval, glanced up at us interestedly, dressed his feathers and resumed his gay splashing. The silvery shower over, he preened his plumage momentarily, and then, on wings that lifted him swiftly into the treetops, he was gone.

On many occasions tanagers have accentuated for me the lure of wild places. There was one such spot where, within the wider canyon walls of buttressed rock, the cascading stream rushed also between deep close walls of green, walls of hemlock and of cedar. From the steep mountainside at a bend of the creek, I could look down into this canyon of green and up along the course of the foaming rapids. The high sun's bright rays lightened on one side the overhanging boughs, darkening the other in contrast, at intervals touching one edge of the racing waters to sparkle in the spray and spume.

From among tall silent cedars on the right bank flashed a male tanager, brilliant and gorgeous in the sunshine. Over the white and green currents he dashed, and up into the bordering evergreen above. Soon he glided out and winged his bright return. It was no more, yet the appearance of such a bird added that final note of life, action, and color that perfected the scene, crystallizing its beauty, giving permanence to a memory.

Nor can I forget the tanager that came on an evening when I was camping among tall, gaunt lodgepole far back in a draw of the mountains. The warbling vireo had ceased to sing his airy roundel. Melodiously tinkling music it was from the white-trunked aspens that climbed upwards in narrow lanes between the conifers, defining all three headwaters of the little stream that gurgled close by. The long purple shadows of the hills already dimmed the forest floor. A deer, descending to drink, warned with startled whistling his kind to beware their accustomed haunt. Not yet had the coyotes flung to the night those wild, weird, though somehow rather plaintive cries with which they commence their forays in the dusk.

It was in the golden afterglow that he came—a tanager bright even in the subdued light. He selected for his point of vantage the tip of a bare, dead lodgepole nearest and but a few feet from my camp. Often from his perch he darted out or up into the yellow light that bathed the roof of the forest. Continually he gave his vigorous calls with snatches of his jaunty song. For half an hour he was there. The golden glow faded. The clouds overhead, well toward the eastern horizon, reddened to rose. Then they were ashes and rose, and then just ashes of roses. The tanager too had gone. Why did he come, choose as was so evident the site of the camp, call and sing so bravely and for so long—I do not know.

During the nesting season the tanagers usually prefer the upper levels of the forest. But when the young are on the wing, and wild berries as well as insects are in abundance, they are attracted to the lower growth and then may be frequently observed by their admirers.

In nesting time are heard the breezy notes of the western tanager, descending from arboreal heights. The "swinging rhythm" of his cheerful song is a signal for every lover of Nature's beauties to approach and marvel.

Here, we recognize, is beauty in a form that is more than transient. If ever we may wander in the Garden of Happiness, then beside that rainbow fountain whose waters bestow blessed forgetfulness, we shall see a bird like this.

I arose from the mossy log beside the little stream where reverie had overtaken me upon the departure of my pair of tanagers. The sun was high and hot, this June day, but I hastened on rested and refreshed. I left these haunts with a feeling that I had discovered hidden treasure.

That afternoon, near the top of a low mountain, I heard the wild scream of a red-tailed hawk, and saw him climbing up into the wind on powerful pinions. I too, following upon the morning, felt within me a similar joyous and uplifting spirit.

And now a few hours later, as I pass this way again in the evening, where the tanagers had so brightly adorned the woodland, the world seems to have paused during those jeweled moments that come at sunset. From sequestered recesses in the forest two lyric voices are calling one to another in inexpressible ecstasy. The thrushes are not long since returned, and their notes are filled with such poignant beauty as well nigh to cause heartache. From the dimming depths their voices arise in divine harmony, singing a chant royal.

Reluctantly I leave them and stride on into the pinelands down toward the river. The long needles of the conifers are burnished by the slanting rays of the sinking sun. In the magic afterglow the front of the ranges is enveloped in a suffusion of amethystine shadows, the peaks are tipped with gold, and from over them, as the sun drops down, come a fleet of scarlet cloudlets drifting into the east—into tomorrow's dawn.

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Among the features in the August-September issue are articles about the stork of Denmark; interesting and colorful little fresh-water jellyfish; the taming of the mushroom; Indian trail markers; search for the lost Shortia; life in a land of hair and feathers; the life of a sea star; the story of the robber fly; life with Cassin's vireo, and many other subjects.

NEPTUNE'S GARDENS

Sea mosses offer an alluring hobby

By C. de WENDLER-FUNARO

FOR THOSE of us who live near the beach, or are fortunate enough to spend some time there, Nature has created miniature submarine gardens of great beauty that vie in charm and grace with any found on land. The seaweeds of our coasts offer a world of interest, pleasure and beauty worthy of more general acquaintance. For students, collectors, and all those attracted by the glories of Nature's handicraft, the simple plants of rock pool and beach display their graceful forms and marvelous variety from the Arctic to the Tropics, from January to December, and from sea to sea, all painted in the delicate hues from Nature's matchless palette.

Our visits to the seashore, whether the rocky coast, the sandy beach, or even the green-tufted mud-flats, will assure us a world of interest if we know the lovely plants that grow between tides, or in the deeper waters off shore. Such an interest, whether pursued as a serious study or as a hobby, will grow with one, and add to one's personality and joy of living. The thrills of hunting and capturing these delicate plants are every bit as real and potent as those enjoyed by the collector of larger animals or plants. The collecting of marine algae, or, as they are often called, sea mosses, is a pastime that flourished in times when folks were less rushed and took time out for contemplation and observation. The older algologists who were most active in the United States did their pioneering work along the New England coast from 1870 to 1900. In respect to works produced, the formation of nationally known collections, and even the banding together into a society that encouraged field excursions and collecting trips, these students set an enviable example. In this day of the automobile and cheap railroad rates, when we may so easily travel to the rocky harbors of Maine or the sandy Florida beaches, ought we not take advantage of these facilities thus placed within our reach, to learn something of the wondrous flora of the sea?

The interest in seaweed collecting finds stimulus in the great number and variety of easily accessible forms, in the beautiful spots to which one is led to seek these prizes, and in the many happy memories of rare finds of treasured specimens. Try it out on your next seashore visit.

PHOTOGRAPH BY W. WINBURN

GRACE AND BEAUTY ARE TO BE FOUND IN SEAWEEDS

They are easily mounted and preserve their grace and color, and a collection will serve to recall memories of many happy experiences

The sport of algae collecting is not confined to any season, as certain forms are found in each season, and some all the year round. As for habitat, their distribution is world-wide. It is well also to call to mind that it was the simple algae that first asserted themselves on the earth's surface when the seas began to recede, and green plants began to appear on land.

The east coast of North America may be divided into three main areas, the Arctic region from Greenland to Cape Cod; a more temperate region extending south to Cape Hatteras; a semi-tropical area ranging south to the Florida Keys and the Gulf coast. Our west coast is, however, one natural stretch of temperate waters, unchanged by either warm or cold currents. One may, of course, go farther afield, and bring back catches from other parts of the world, for there is hardly a coast that does not offer some choice form of exquisite pattern peculiar to its waters. One advantage of this hobby is that specimens are easily preserved and kept, little space being needed for the mounted plants, and no unwieldy apparatus for their gathering or preparation.

A few of the more remarkable forms, which perhaps rank amongst Nature's most bizarre creations, are not to

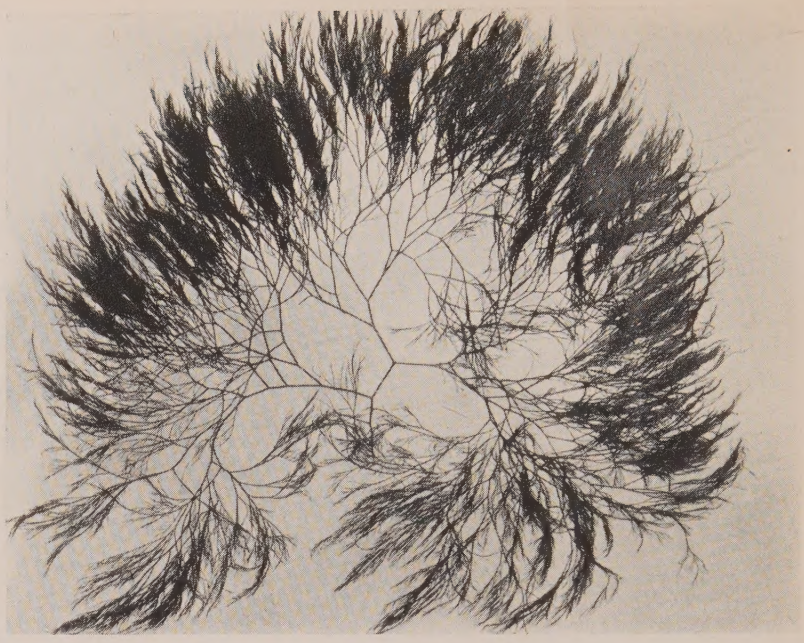
THREE MOSSES OF THE SEA

Above is one of the genus *Ceramium* with pearly clustered fronds, delicate as the dewy threads of a spider's web. At the left is gauzy *Ectocarpus*, and, below, the lovely *Dasya elegans*, a splendid example of the beauty found in Neptune's gardens

be included in a collection of the kind described, though they are none the less interesting to the seaside visitor. The extent of one of the seaweeds, called the sea cabbage, is so great that its floating bladder serves as a raft for the sea otter. This air vessel is supported on a 300-foot stalk from which many thirty-foot-long fronds spread. The great masses of seaweed recorded by early navigators, who were terrified at the endless entanglement through which their galleons forged, were the sargasso weed, which is one of the wonders of Nature's great array of sea plants.

In an outing to the seaside we would probably come across a great variety of smaller forms as well as some cumbersome, thick, or leathery varieties. The former would, of course, be the ones that we would find of greatest beauty for our herbaria. They are so easily mounted, they retain their normal colors so well, and so naturally preserve the grace and charm of their normal state, that it is a pleasure to see a well-prepared collection of sea mosses.

Since we are practically unrestricted in our choice of season or locality, let us annihilate time and distance by flying on the fleet wings of imagination to Marblehead's rocky coves in Massachusetts. We need little equipment on our trip; some drawing paper, blotters, a pail, a little skill, and the love of the outdoors. All being ready, our day of exploration begins at low tide and, with our rowboat following the rocky coastline, we carefully peer down along the water's edge to see the growth of green, red and brown mosses that covers the submerged rocks and pierheads like the wavy tresses of swimming sirens.



ANOTHER INTERESTING SEAWEED
This is *Polysyphonia,* a red, matted form that floats in globes, like tumbleweeds that roll over the prairie

We dip our hands into the smooth blue water and, although the dim forms are momentarily lost from view by the breaking of the water's surface, the sylph-like figures do not flee and are easily brought up and placed in our pails. The dark red, almost brown, plant brought forth from the sea does not look promising—rather like a wet mouse, or the sediment in a bottle of vinegar. What a surprise when we see it afloat, spread out as exquisitely as a Spanish fan, all lace and gentle grace! As the ugly caterpillar changes to a beautiful moth, so does the delicate sea moss change before our eyes. We carefully float our prize upon a piece of drawing paper to which its graceful branches adhere by means of its own gelatinous contents, and thus are preserved for many years both color and spidery filaments.

The nearer our plants grow to the surface, the more verdant they are, all shades from Erin's brilliant green to the dull olive of Spain's more somber hues. *Cladophora* with its spongy growth covers the rocks of pools formed by the receding tide, and in its many branchlets we see darting about an infinite number of minute organisms that dwell in this green forest of sea moss. A world of many dangers this, where small creatures lie in wait to prey upon even tinier ones. From these lovely plants we come upon kelp and Irish moss, coarse and crinkly, ranging in color from purple to brown. These need a heavy press for their drying and preparation, but not so the many lovely types of gentle fronds such as the Floridaceae, or red algae. It is difficult to proceed along this rocky shoreline without being diverted by many curious algae, each one seemingly more beautiful than the last. Tide pool or rock cavern of crystal clear waters, each offers a mosaic of beautiful hues like Teheran or Chinese rugs. Here, *Hildebrandtia rosea,* with bright pink plush; there, deep red *Petrocelis cruento,* with its coralline branches; and still another beauty, *Rhodymenia palmata,* which never fails to evoke a thrill upon discovery. We wade into shallower waters and find the sandy bottom showing up the floating red mosses like the white paper that will soon serve as the mount of the flowery glory of the New England coast, the resplendent *Dasya,* which is in truth well named *elegans.*

It is a pleasure to float the various plants picked out of shallow waters in a porcelain plate or pail, as a means of studying the moods of these delicate growths. Their natural forms vary with every current of the water in which they dwell. Unlike most other objects of beauty, distance does not lend them enchantment, for the closer we observe the minute wonders of the marine garden the more wonderful they appear. Many of the most insignificant clusters or clumps of fuzzy green mosses are found to be as charming as the more showy species. The graceful and fragile filaments of gauzy *Ectocarpus,* plumed *Bryopsis,* and gentle *Cladophora,* are seen as we row along in shallow waters. They are attached to stones and wooden posts, and swish gently with the current. Under the hand lens we see the beautiful mossy fronds that are like the little spicules of a gorgeous plume. When we come into a quiet cove we find much of the loose drift of the tide backed into the shallow water and here we find great masses of *Ulva,* or sea lettuce. This does not offer much for our collection, al-

FOUND IN SHELTERED POOLS
Cladophora with its gentle plumes may be discovered waving its green fronds and inviting the collector

MANY-BRANCHED *BRYOPSIS*
It drifts lazily ashore, there to be caught up by incoming waves

though to the larger pieces of eel grass smaller and more delicate species of red algae are attached. *Chaetomorpha*, a green, unbranched, hair-like mass, floats like a maze of shoestring never to be unraveled.

By now we have filled our pails and the painstaking work of mounting our trove begins. A quiet and protected cove will serve as our laboratory. We immerse a sheet of drawing paper beneath one of our prizes as it floats in the clear sea water; carefully we raise the paper on which the moss is spread artistically. A little coaxing and aligning with finger or pin will reveal the subtle beauties of the specimen. To procure a graceful mount is not so simple, for many a branchlet will prove obstinate and float into a mass. A well-mounted, symmetrically-balanced sheet is a work of art, and not a little credit is due the skill of the collector in selecting and arranging his treasures. Now all is ready to place our mounts to dry on the sun-bathed rocks nearby, and, after a short exposure, we may gather up our finds.

The day is done, and of the many lovely plants secured from rock, pile, mudflat, or sandy beach, we now have our choice. In years to come many will bring back the happy memories of the delightful hours spent at the shore, where Neptune's gardens grow in Stygian depths, far from the peering eyes of mortals and the penetrating rays of the earth's bright sunlight.

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Yews for Planting Beneath Windows *By* VICTOR H. RIES

DRIVE UP and down any street, anywhere, and you are sure to see at least one evergreen, and usually more, that, because of improper selection, have completely hidden home windows. This need not happen if care is used to select evergreens that do not grow high.

Outstanding among the low-growing evergreens are the yews, both English and Japanese. The Japanese is the hardiest, enduring temperatures of at least twenty-five below zero. The English, and the hybrids with English blood, are less hardy and should not be used north of New York, Cincinnati and St. Louis.

The yews have been selected and hybridized until there are now a variety of forms, some, like the parent type, relatively low-growing and spreading, while others grow upright. Some form pyramids, others slender columns.

The plant beneath the windows in the accompanying photograph is the dwarf Japanese yew, *Taxus cuspidata brevifolia*. It will stay within bounds in a location such as this for years. If the typical Japanese yew, *Taxus cuspidata*, were used, although it is of low habit of growth, it would require considerable yearly pruning to restrain its vigorous lateral growth.

Both the Japanese and the English yews may be grown alike in sun or shade. They maintain their luxurious dark green color the year around. Practically free from insects and diseases, they are one of the best of horticultural investments and solve problems for the home-owner.

THE FARMER and the GAME BIRD PROBLEM

Sportsmen expect the tiller of the soil to feed and care for the game so they may reap the profit

By ROBERT PAGE LINCOLN

GRADUALLY but surely the truth is dawning on the sportsmen of the country that free hunting grounds are diminishing in area, and farms with "No Hunting" signs prominently displayed are becoming more and more in evidence. Invasion of the farmlands by hunters is being viewed in the light of trespass by many farmers who are becoming conscious of the fact that the lands they control are *their* lands, and that sportsmen have no right to hunt over them without permission. To date this consciousness of rights has been decidedly dormant; now it is awakening. The attitude, from the standpoint of many, is something like this: If my lands produce game birds and they possess value, I can demand payment for hunting rights on such lands. If I cannot derive this payment then I shall close my lands to hunting and exert my authority to keep the sportsmen from my acres.

The sportsman himself has viewed the situation with no little alarm and distaste. I say "distaste" because it is common knowledge that the sportsmen never have considered the farmer as an important factor in the game problem. Indirectly it has been their hope and suggestion that the farmer leave his lands open to hunting; that he arrange no end of shelter on his lands for the game birds; that he leave shocks of corn and other grain for the game to feed on; and, in the winter, that he take it upon himself to trudge through the snow to appointed places and deposit, under shelters, the food on which the birds are to gain strength to carry them through the inclement season. In the villages, in the towns, and in the cities, the sportsmen gather and eat. At such times the problems of conservation arise, and the farmer is unanimously asked to feed the game birds. It is the usual "let George do it" attitude, the insufferable point of view that assumes that the farmer should take care of the birds so the sportsmen may range over his land in the fall and reap the crop. All they believe they should give for this right to enjoy themselves and kill the game is the payment of a trifling annual license fee such as the state exacts. Their contribution toward the upkeep of the game is practically *nil*. On rare occasions the sportsmen welcome in a few farmers and, by the aid of dinners and the drinks, seek to create an attitude of "good will", as they call it, with the tillers of the soil. This is merely a bluff, and while some farmers are likely to be thus fooled into making unguarded statements, most of them easily see through it.

The whole game conservation problem, in the minds of many sportsmen, rests on sportsman efforts to get the farmer to feed the game birds free of charge, and to obtain the privilege of hunting on his lands without cost. Were it not really so serious anyone could see how ridiculous it is. Why the farmer should do all of these things for such a narrow-minded group is difficult for anyone to understand.

To get first-hand farmer opinions, I made it a point some time ago to ask a hundred farmers their views on the matter. An enlightening cross-section of opinion it was. Over ninety of the men questioned told of depredations by hunters on their lands; of fences broken down, gates left open; of cattle and other livestock shot; and of turkeys and chickens killed in true foraging style. Not one of those questioned had ever received any money with which to feed game birds, but all of them had been asked to feed them, to make cover for them, to leave weeds standing in fence edges and roadsides, and in other ways to save the game for the sportsmen to hunt the next fall. After all, "good will" is something that works both ways.

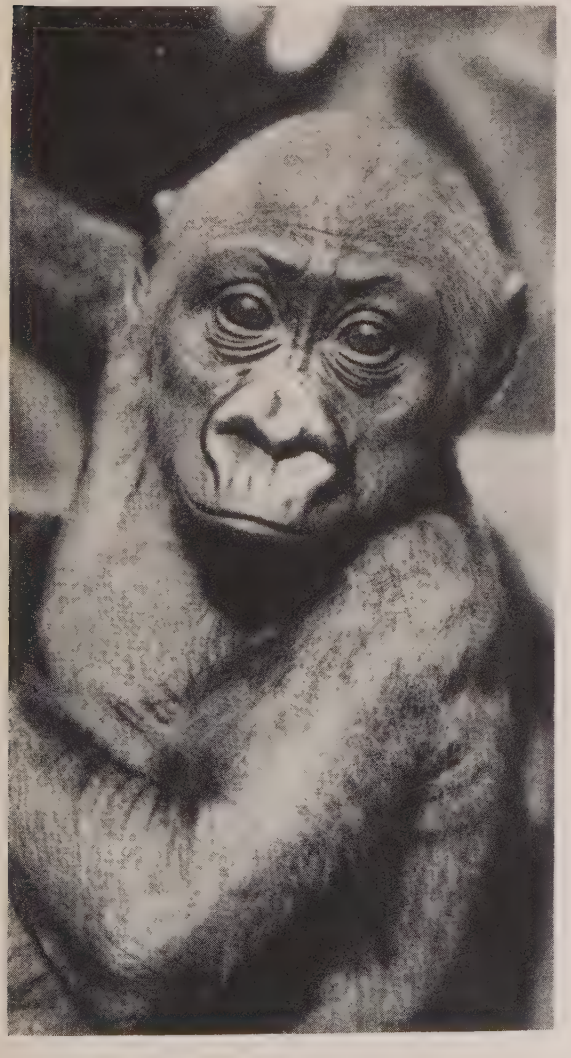
BOBBY

A gorilla from the West African Cameroons

By ERNST SCHWARZ

I KNEW Bobby for a number of years. When he arrived from Africa, he was just a little baby gorilla. His skin, including his face, hands and feet, was jet black, and his short woolly coat chocolate brown. The iris of his eyes was deep brown, and the white, which you cannot see in all the monkeys, or even in large apes like the chimpanzee, was clearly visible. This feature, combined with the broad and flat nose, with its conspicuous margins, gave him somewhat the appearance of an exaggerated type of negroid countenance.

Bobby was quite a nice tame baby, and with his playmate, a male baby chimpanzee, Toto, he used to draw big crowds at the Berlin Zoo. One could not say that there was any decided difference in intelligence between the two, but the difference in temperament was conspicuous enough. The chimpanzee was quick, alert, noisy, always on good terms with the visitors, and constantly doing something naughty to amuse them. The gorilla, on the contrary, was a much more quiet animal, but always watchful, more refined in his manners, less inclined to climbing, and never in a mood to be deceived by the tricks of his companion. Even in those early days Bobby used to beat his chest with his fists, to "drum" like any adult of his tribe.



BOBBY AT ABOUT SEVEN YEARS

He grew rapidly in size and strength. When he came to the Berlin Zoo he was about three (left), a twenty-seven pound youngster

Like other young apes Bobby was fed on a child's diet. He had fruit of any kind, such as bananas, apples, grapes, as well as milk, eggs, cooked meat and buttered bread. He was particularly fond of salad and fresh celery. He also got a controlled amount of pure vitamin D. His cage was furnished with an "artificial sun", composed of a powerful electric bulb and an electric heat radiator. Like most other captive animals, Bobby was very fond of the light and heat thus provided.

When Bobby grew up, and he grew at an astonishing rate, he soon became unmanageable, and could be handled with

BOBBY AT ELEVEN YEARS
He then weighed 520 pounds and had acquired many gray hairs. He was one of the largest gorillas known. He died from appendicitis

impunity only by his keeper. I remember well that when he was about five years old I first found it inadvisable to enter his cage. He was already rather strong and, although still good-natured, he had a rough manner of playing with one. As he was not yet aware of his strength, nothing serious happened, but it was quite evident that anything could happen, and that he should be kept away from the public. He had the habit of attacking suddenly without warning, which makes primates more dangerous than many other animals. Even his keeper was not quite safe from this type of erratic attack, and was, therefore, provided with an electric club. The arrangement was first shown to the animal, and an electric blow was dealt out to him. From that time this proved to be a reliable safeguard, as Bobby remembered the shock perfectly well and always remained afraid of the club.

As already indicated, Bobby grew rapidly. When he arrived in Berlin in 1927 he was about three years old, and his weight was about 27 pounds; when he died from appendicitis in 1935, at about eleven years, his weight was 520 pounds. As a matter of fact he probably was one of the largest gorillas known, although he was not fully adult. He had become extremely fat and there obviously was some upsetting of the glandular balance. Whether this was an abnormal condition or whether it was just a stage comparable to that passed through by human juveniles just before maturity remains doubtful.

With age Bobby gradually lost his chocolate color. He first turned black, and developed a chestnut cap on the top of his head. Later on he became slightly speckled with gray, and in later years produced a lot of white hairs on his back and thighs. The hair on the breast grew long and his arms became shaggy. This development of long body hairs, as well as the growth of scanty whiskers, the whitening of the hairs on the head and back of old gorillas and chimpanzees, seems much like similar developments in the aging human, and in fact is identical.

Bobby was brought from the southeastern corner of the Cameroons in West Africa. He belonged to the western or coast type of gorilla, which is easily distinguished from the mountain gorilla of the eastern end of the great central African forest. This latter member of the genus has an abundant growth of black hair all over the body.

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NOSTALGIA

By PHYLLIS FAIRFIELD

Hummingbird, in Yucatan
Tell me when you first began,
With the quickening of the year,
To remember gardens here.
Did some southern scent recall
Honeysuckle on a wall?
Or, did tangled tropic bowers,
Call to mind our friendly flowers?
Fairy, did you then take wing,
Knowing here it would be spring?

B[illegible]nsend's

A[illegible]aire

Wes[illegible]cluse of the

By [illegible]main solitudes

By RUTH WHEELER

IN THE high mountains of the western states, where the Douglas firs grow far apart on the sides of the broken granite slopes, a gray bird flies quietly through the scattering woods and alights on the upturned roots of a fallen tree. After a few minutes it deserts its perch to catch an insect in mid-air, much as do the bluebirds of the plains below. It is a Townsend's solitaire, a bird recluse of the mountain solitudes.

The solitaire is a thrush, and one of the loftiest dwellers of all the thrush family. There is an air of mystery about these birds that flit quietly and unobtrusively through the mountain forests. They never go in flocks but seem to live to themselves, satisfied with the vast expanse of the upper world that is their kingdom.

Just as wild and full of romance as the region in which he lives is the song of the solitaire. He usually pours out his melody in a clear, rippling, penetrating warble from the summit of a high stub. This full, free song is the very spirit of the forest, the granite crags, and the tumbling mountain streams.

A TYPICAL NEST SITE IN A CREVICE

PHOTOGRAPH BY H. D. WHEELER

The mother bird bravely stayed on the nest while being photographed, but warily watched the camera

One hot May day we climbed the long winding trail to the top of Yosemite Falls. We dropped down to rest beside the stream just a few feet above the ledge where it shoots off into space, to pound upon the rocks hundreds of feet below and go roaring down a cascade, only to spread out into a great waving veil of water and mist as it plunges to the valley floor.

As wave after wave shot out from almost under our feet and fell in great plumed meteors, we felt the sensation of being drawn into the whirling torrent until we seemed to forget the reality of things. Finally we broke away from the spell of the falling waters and climbed back up the trail to a less turbulent spot where we could rest with more security.

Suddenly a clear, bell-like trill came to us above the roar of the waterfall. We looked up the creek and saw a gray bird sitting on a stub singing his wild song in an ecstacy of delight. With our binoculars we made out his coloring and were sure we were seeing our first Townsend's solitaire. After his song was ended he flew across to a tree, hesitated a few moments, and then darted down to a ledge on the rock wall at the side of the stream. Here we saw a clump of twigs and mosses that must have been the nest. The bird stayed there only a few seconds and then flew away.

This was the typical nesting site of the solitaire, a crevice in a bank near a stream. Sometimes the bird will build her nest on the ground at the base of a tree. W. L. Dawson, author of *Birds of California,* tells of finding the nest of a solitaire in the upturned roots of a leaning tree near the water.

But even this bird of the wilds has been known to take advantage of the hospitality of (Continued on page 384)

Fire Weed

By ZETA YOUMANS

THIS is a story of rehabilitation by a weed, a story that you may verify this summer if you spend August or September in the woods, especially in a district that has some cut-over land. Although fire weed is one of the class of plants usually looked upon as "pests", the manner of its seeding, the color of its blossoms and the ground upon which it grows most freely give it unusual significance.

Nowhere is the ingenuity of Nature more clearly displayed than in her mechanical devices for the distribution of plants. To some long-lived trees she gives seeds in strong shells that are slow to sprout, but whose rich kernels tempt the squirrels to store them underground, sometimes at a distance. In others, like the conifers, ashes, and maples, she wings each seed so that it may be carried by the wind as it falls whirling to the ground. Others have edible seed-coverings that attract bird or beast. Many of these seeds inside the fruit have a hard jacket that withstands the digestive process. Others, more lowly, have tiny hooks or prongs by which they become attached to the fur of creatures able to move about. Some, like the familiar jewel-weed, have the seed pod so ingeniously constructed that it bursts when ripe at the slightest touch, and forcibly ejects the small seeds by a tiny coiled spring in the pod. Thus any disturbance of the jewel weed when the seeds are ripe helps to spread the seed for next year.

WAITING FOR A VAGRANT BREEZE

The seed pods of the fire weed have opened and the seeds are ready to take wing to nearby soil

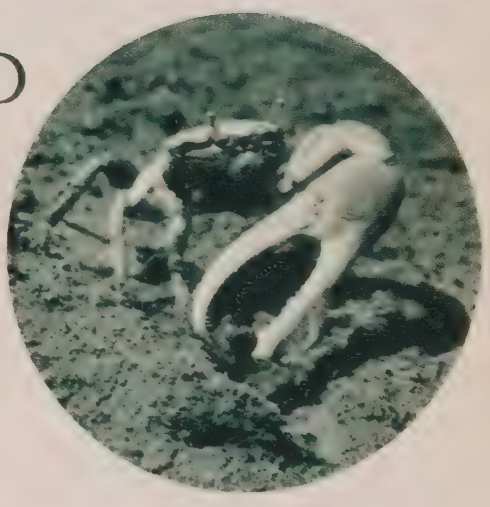
To accomplish her purpose of planting seeds Nature may press any of us into her service without our consent. If you walk in the fields or woods and stop to pull from your clothes and throw to the ground a stinging pricker or bur, every gesture you make benefits the plant that grew that particular kind of a seed. If a child picks the head of a ripe dandelion and pretends to tell the time by the number of breaths it takes to blow off all of the fluffy top, she has only saved the wind a job, and has done exactly what the dandelion needed. This common flower is one of the most familiar of those to which Nature has given the air-floating seed carriers and this attention has been justified.

Less generally known, fire weed, also called great willow-herb, sends forth whole fleets of lighter-than-air-craft seeking new fields for growth. This explains in part the wideness of its distribution, for it covers most of Europe, Asia and North America. Civilization plays a part in its spread, for whenever industry needs wood, forests fall under the lumberman's axe. When the trees have been stripped from the land there remains the waste of stump-land and slashings. These make ready fuel for the thoughtless camper's unextinguished fire, or the careless motorist's burning match. Fire, eager and devouring, sweeps through. All that was left of beauty or greenness becomes blackened ugliness; and there, in the devastation wrought by man's ruthlessness, Nature performs one of her miracles. Over the burned area a plant begins to grow. Tall, slender, rank upon rank, it obliterates the ugliness with welcome green. Summer progresses. The warm July sun pours down upon winding road and rolling country. Then, over the hideous charred stumps and blackened ground, the tall green plants burst into a flame of magenta bloom.

The weeks of summer pass. The first blaze of fire weed's beauty fades. The blossoms disappear, and long slender pods take their places. Then as summer wanes the slender pods split. From each one, and there are many on a stalk, many fine, silky white seed carriers emerge, as ready for flight as a butterfly when it pulls itself free of its cocoon. And there they cling, until the winds carry them away on their mission of rehabilitation.

Still another method of helping itself to carry on has this versatile plant. Its roots are perennial, and once the plant is established in a given spot, it may persist for many years without flowering, spreading by its roots. As far as we are aware this occurs only along the plant's extreme northern border, where the short growing season may restrict its flowering to an occasional favorable summer.

RED-JOINTED FIDDLERS



By IVAN R. TOMKINS

The warmer and moister parts of the world have many kinds of crabs. There are some that walk on the ocean floor, others that are free-swimming, and many that live on land in moist locations, and, on occasion, may even climb trees. One unusual group lives in the shelter of the shells of certain bivalves, oysters, clams and mussels, and these are said to be commensal, that is, to feed from the same table.

The members of one group of land crabs are known as the fiddler crabs, because of the one large claw or cheliped that is carried by the males of this group. If this large claw is broken off, the one on the other side will, after several moults, become as large as the one lost. So it is common to see both right- and left-handed fiddlers in one colony. The females do not have this large claw, and seem to be more retiring in habits.

The red-jointed fiddler, *Uca minax,* shown in these pictures, is quite representative of the group, and is found along the Atlantic Coast from New England to Texas, even going inland along water courses for some distance.

All over the mud-flats and the salt-marsh meadows these crabs have dug their holes down to water, and often the entrance is hooded or canopied with the mud pellets brought up from below. It is quite amusing to see a male fiddler, with its large claw held aloft, back up to a burrow entrance that looks much smaller than itself, fold down the cheliped and slip sidewise into the hole. If one is quiet, it takes only a few minutes' waiting before the crab is again foraging on the moist or dried mud outside. But the raccoons are never able to understand this. They will dig deeply into the mud for one fiddler, when others are moving around only a few feet away, or when a few minutes of waiting would bring it out to be caught easily. But no, the raccoon has a single-track mind, and when once interested in a buried fiddler, it will not leave until it has dug a good-sized hole. At some times of the year the open flats are littered with the debris from the raccoons' excavations.

A host of birds, as well as other animals, prey on them. Curlews slink along, then suddenly reach down a hole with that long down-curved bill; clapper rails in the salt marshes, and their cousins, the king rails of the fresh water, are often seen carrying one across some open space, to stop at the first cover to dismember and eat it. Crows and gulls, grackles and many other birds that

commonly frequent the marsh or shore feed upon them. Yet on the day following a wholesale feast they always seem as numerous as before.

The crabs feed largely on algae, which are gathered with the small claw and carried to the mouth-parts. The females, with no large and cumbersome claw to hinder, use both claws to pluck the algae and carry them to the mouth with alternate strokes of the right and left hands.

It has been said that the males use the large claw to roll up the pellets of mud from down in the burrow. Instead, they probably accomplish this as do other closely related forms, by rolling the pellet along between the walking legs as they come up. Indeed, there is no other place for the pellet to be carried when the crab so exactly fits the hole, unless it be pushed ahead.

If there is a use for the large claw of the males, it must be either when above ground, or in some enlarged chamber below, for in the visible part of the tunnel the cheliped is folded down so closely that no great opening of the movable finger is possible. The entire large claw curves around in front of the crab's body and so closely fits its shape as to complete the circular outline. Several males are often seen crowded together in perfect amity, and the clumsiness of the large claw makes it appear valueless as a fighting weapon.

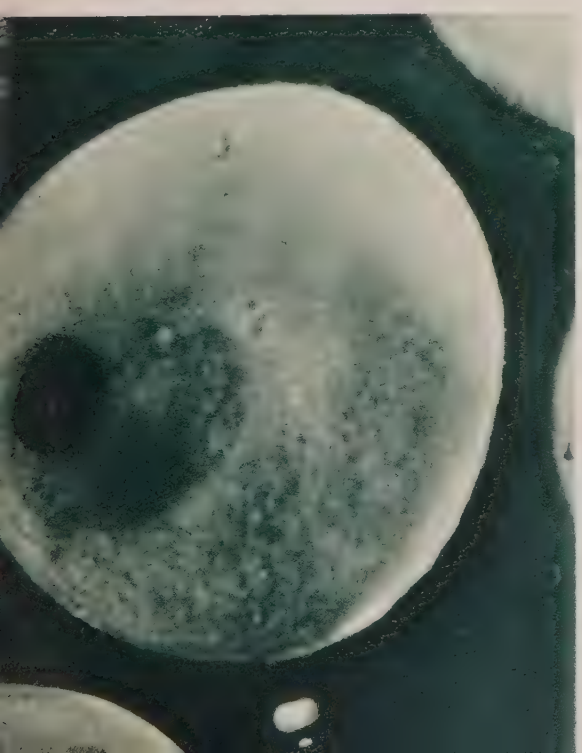
Like earthworms in a different type of soil, this species serves a purpose in the general economy of Nature by turning over the upper layers of the soil. Although the amount of earth handled by the earthworms might be hard to estimate, the number of new fiddler crab holes in a certain area might easily be calculated to determine about how long it would take to turn over the entire upper layer down perhaps to nine inches deep. The burrows connect in a maze below. The porosity of the marshlands must be greatly increased and the drainage of surface waters, as well as the impounding of them below, assisted by these activities. Where drainage of the salt marshes has been done, for the purpose of mosquito control, not only the fiddler crabs, but the clapper rails, seaside sparrows and marsh wrens, in fact the whole of that most interesting salt-water fauna, have gone elsewhere, and left it a biotic wilderness.

Breeding of Brook Trout

By ARTHUR H. FISHER

Unlike the western salmon, which die after their first spawning, our many beautiful varieties of fresh-water trout continue to deposit their eggs annually over a period of several years after maturity. The male and female brook trout make their way upstream in the fall to the spawning grounds. Our first picture is a close-up of the male and female on a gravelly bottom where the latter has decided to deposit her eggs. An adult brook trout may lay from 750 to 1500 eggs each season; these, when deposited, are immediately fertilized by the attendant male. The female buries the eggs in the gravel.

In a short time the eye in each egg is plainly visible, and from this stage the development is quite rapid, the eggs hatching in from 20 to 30 days, depending upon water temperature. In our eastern waters, the brook trout spawns in the fall when the water temperature has moderated to about 40 degrees. When the fry emerges from the shell, it retains a yolk sac that provides nourishment until it is absorbed. Then the baby trout can capture its own food, consisting at first of minute organisms.



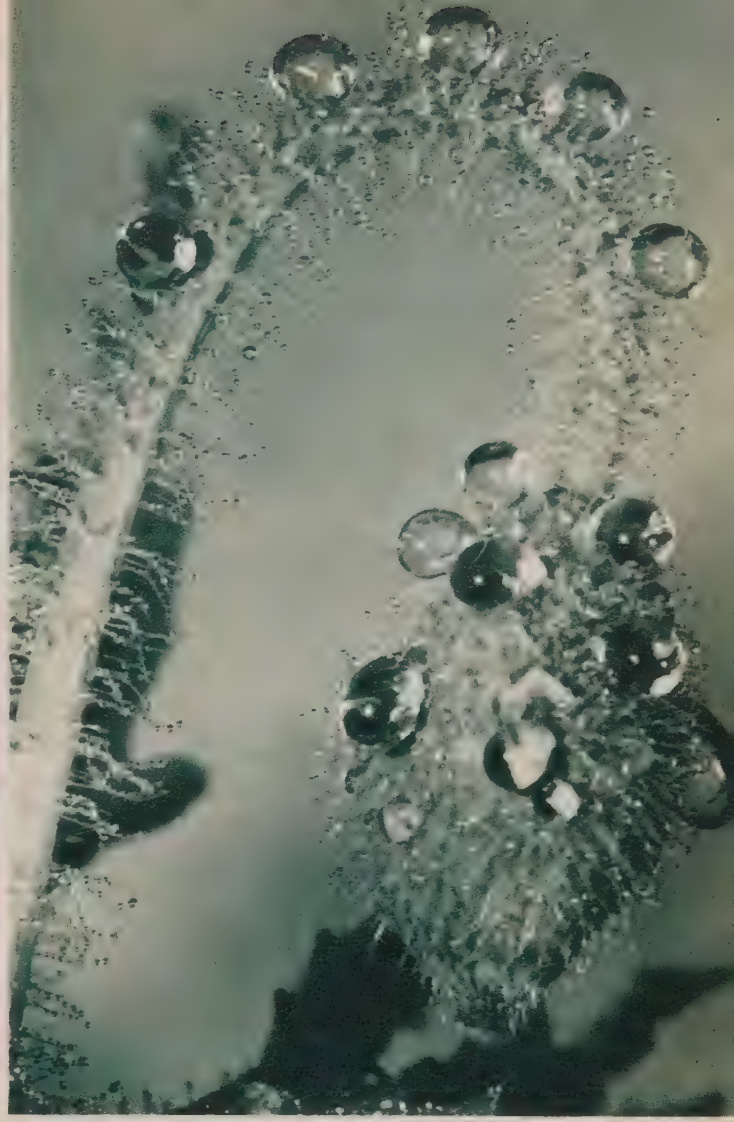
LITTLE DROPS OF WATER

By HARRY PEDERSON

Nature seems always trying to outdo herself; to add a last touch to the beauty that is ever hers, like a débutante before the mirror seeking some final adornment that will make her forever remembered. In autumn it is the brilliant colors of the leaves. In winter it is frost and snow that, with swift decision, may change everything to black and white, garland the slender branches of the trees, hang weeds and bushes with cotton bolls, or cap with frosty meringue each rock and post and flat-topped thing. In spring and summer it is fog and dew, adding perhaps the most beautiful, delicate touches of all.

As the sun is rising, when the air is yet still and fog softly blankets the hollows, when the birds are chorusing to the new day and from all about comes the half-heard drip of water from overburdened leaves, this is the time to find the beauty left by fog and dew.

Down through the ages a dew-pearled rose has been a sight of beauty sufficient to send poets and singers into bursts of song. In a million gardens there will be roses in bloom today, and almost every morning dew will add its ultimate touch to their beauty. Even the saucy-faced pansies beside the garden path feel the touch of dew and bend their faces to the ground.



When the sunlight strikes the top of a tousle-headed ear of corn it lights up like a candle from the sparkle of the dew-drop diamonds that encrust it. The stems of poppies have a growth of tiny bristles and are, consequently, ideal for catching dew-drops. The bashful bud has collected more watery jewellery than it has any right to, and has added a crown of huge brilliants that is nothing less than gaudy.

During the night spiders have been working, setting their traps for prey. But now they are curled out of sight beneath some protecting leaf, and their nets are decked with water pearls beyond the possibility of holding more. Like fairy lace, placed on display in the enchanted hours of dawn for the wonderment of mortals, they hang in the silent air, decking tree and bush, weed, fence and drooping grass-head with such an infinite variety of scintillating loveliness that it seems that such things cannot be of earth. All things are studded: the tendrils

of the English peas, the petals of the water lily riding the quiet surface of the pool. All about, each thing is embellished with an added touch of beauty.

But the display is short-lived. A breeze begins to stir, the fragile spider-webs toss wildly like clothes on a line, tearing apart, freeing drops in showers; the little water-balls that rested upon the bended grass blades roll to the ground and disappear.

Almost magically it is all over; there is nothing left but here and there a tiny drop of water dying in the sun. And one walks on with only the memory of what beauty can result by combining sunlight with a few drops of water.

A MONTH WITH THE NESTING GOLDFINCHES

By

W. W. COLEMAN

and

FRANCIS J. WILSON

We were searching for kingbirds—new subjects for our joint hobby of bird photography. Frank was on duty in the blind and Wally was wandering over the prairie. In a small cottonwood tree, not more than eight feet tall, on the edge of a bluff, Wally located a nest placed in a three-way fork of some small branches about five feet above the ground. On examination, the nest proved empty, but it was in such excellent condition, despite heavy storms of the previous week, that there was no doubt of its newness. Here was material worth keeping under observation. Who were the designers of such a fine piece of work as this? Failing light sent us home with our query unanswered, but we planned to return at the first opportunity.

Another Sunday came along. Free again from the troubles of office and laboratory, we tramped with our load of cameras and blinds to the scene of last week's discovery. When we crept silently up to the nest, a greenish-yellow head with two small black eyes peeped at us from under a dense cover of leaves. A short bill, heavy at the base, placed its owner as a member of the large family that includes the sparrows, the grosbeaks and the finches. The bright eyes followed our every movement. Within six feet of the nest the little mother's patience could take no more. Silently she slipped over the side of the nest and disappeared in the foliage below. Both of us were convinced she was the female American goldfinch, *Spinus tristis*.

Some additions had been made to the nest during the week. A deep compact structure of grass and plant fibre lined with finer grasses and plant down formed a perfect pocket in which lay four small white eggs. Their translucent shell showed a slight pinkish tinge. "Is the clutch complete?" is the question we wanted answered. A hurried trip made to the nest the following day revealed that another egg had been added to the set.

Sunday again rolled around and another day was available to spend with the birds. Again we quietly approached the nest, and the female seemed more reluctant than ever to leave her duties. We were within three feet of the nest before she took alarm and slipped into the foliage. Examination of the nest and its contents showed the eggs considerably darker, suggesting the quickening life within. In all visits to the nest a watch had been kept for the male bird but no sign of him could be seen.

A Wednesday afternoon holiday afforded us time for our next visit. This time the mother goldfinch allowed us to approach until an outstretched hand caused her to take flight. Peering into the nest, we found four of the eggs transformed into ugly little bits of bird life, naked and blind. With such helpless charges demanding her care, it is no wonder the mother's protective instinct held her to the nest until the final second. Plans were made to spend the following week-end in a blind at the nest, observing and photographing such incidents of goldfinch life as would be possible.

At our next visit, we were delighted to find that the fifth egg had hatched, and that the young, although still blind, had a

slight covering of down and seemed healthy, strong and hungry. The blind was erected about three feet from the nest. Before the walls were securely pegged down a glance up at the nest revealed the mother had returned and was sheltering her small charges in spite of the hammering going on directly at her front door. We were delighted, as her ready acceptance of our intrusion meant a wealth of observation on the morrow.

At ten the next morning the camera lens pointed through a hole in the wall of the blind. After a slight wait, the mother goldfinch returned to the nest and had her picture taken as she stepped out of the leafy covering below the nest. Other pictures were taken of her as she brooded the young. Several times she was flushed in order to obtain characteristic poses as she returned to the nest. In every instance she used the same path to approach the nest. We settled down on our camp stools to wait and watch developments. Suddenly there was a call from the top of a tree in the bluff to the right. It was the male goldfinch. Turning to the female we found her quivering and emitting plaintive, low-pitched notes. The male came nearer and nearer, hesitating warily between each approach. At last he gained the nest. Standing on a branch beside the nest the male proceeded to feed the female by regurgitation of food from his crop. Completing the feeding the male left the nest and did not again approach it during the observations of the day. Immediately after the male departed the female hopped up on the edge of the nest and proceeded to feed to the young the same food.

As the afternoon wore on, the heat from the sun increased. Leaves sheltering the nest had been tied back to permit photography. Mother Goldfinch now changed her position from the brooding posture she had assumed earlier. She rose higher in the nest and turned her back to the sun, her flexed wings shading the young.

The next mid-week excursion found only three young left in the nest. These three, however, were strong and had grown a great deal since our last visit. Both male and female were now busily engaged in supplying food for them. Again the male was observed to feed by regurgitation, but this time directly to the young.

A week later, the nest was again visited. At this time the young were well fledged. Sitting down in the shade some twelve feet from the nest we were surprised to see the female, keeping well under cover, approach with food into the lower branches of the nesting tree. Calling gently, she coaxed the strongest of the young over the edge of the nest and down into the branches to be fed. The following day the remaining two young had also left the nest and our pleasant month with the goldfinch family had drawn to a close.

THE LIFE OF THE MOURNING CLOAK

By L. H. BRUBAKER

The life of the mourning cloak butterfly, *Vanessa antiopa,* found both in North America and England, is long and active. The mother lays her eggs in a mass that completely surrounds a small twig of willow, elm, or poplar, so that her young will have a convenient place to feed when they arrive. These eggs are laid in the late fall and hatch in spring when the leaves are fresh and green.

After cutting through the egg shells, the caterpillars emerge from the eggs as shown here. They are then slightly under one-eighth of an inch long. They crawl up the stem, spinning a light web as they go, and start their first life project. They begin to eat within a few hours of hatching, and after a week of feeding on the young leaves they have become about three-sixteenths to one-quarter of an inch long. They are nearly black in color, and the spines are still hairlike. The mass of web that they spin serves as a common ground to which they retreat after feeding. Throughout the day (or at night if placed near a brilliant artificial light), they eat continuously, crawling only a few inches from their retreat and returning to rest together when the light gets dim.

In order that caterpillars may have room to grow, they must go through several molts; the cast-off skins can be noticed from time to time along the stems. At the end of two weeks the caterpillars are three-eighths to three-quarters of an inch long. The hairs that grow in rows on each side of the back have become spines, and the orange-red coloring of the feet and the markings on the back have appeared. The caterpillars still retire to the web to rest at night. This web is insignificant in comparison to that of the tent caterpillar, and seems to be made only that they may cling easily to the branch during these resting periods.

Loud sounds or vibrations cause the caterpillars to

lift their heads to see what is going on about them, but on the whole their enormous appetites keep them too busy to allow for much interest in the outside world.

If the caterpillars have plenty to eat, they reach full size in about three weeks after hatching. The mature caterpillar is one and a half to two inches long. At this stage the spines are definitely branched near the ends, giving the caterpillar a somewhat vicious appearance. They cease resting together and wander about the branches, or leave the feeding ground entirely and search for a suitable place to pupate. Details of this process are shown on this page. The caterpillar may start several webs before he makes one that satisfies him. He first spins a pad of web on the lower surface of some sloping or horizontal surface, and then continues the spinning process, which takes several hours. The head is moved slowly from side to side as the spinneret emits the liquid silk and attaches it securely to the surface on which the pupa will later hang. When the web is inspected and found to be satisfactory, the caterpillar turns around and grasps it with the posterior prolegs. The other feet then let go, and the body hangs suspended, head downward, by the anal prolegs alone. The head and front feet are hunched upward and toward the stem, giving the appearance of an inverted question mark. The caterpillar remains in this position for about thirty-six hours.

Several times during the hours of hanging the cater-

pillar goes through convulsive movements of a nature somewhat similar to the movement of one's hand when a tight glove is being put on. Then, suddenly, during one of these violent movements, the back of the caterpillar's skin near the head end splits, and with much swinging, contracting, and elongation of the body the old skin is worked upward, and the pupa is exposed. The movement rapidly pushes the skin still farther upward. After not more than five minutes of violent movement the old skin is shoved up to the clasping end and dropped off, and the pupa hangs complete, in shape exactly the same as it will be a week or more later. It is rather interesting to note that the eyes, wings, antennae, and feet of the future adult are all outlined in the pupa even before the old caterpillar skin is entirely shed. Evidently a great deal of preparation has gone on beneath the old skin in those hours of hanging. The newly-formed pupa is quite dark, but gets lighter in color in a few hours.

After about thirteen days in the pupa stage there is a general darkening within the whole case. When this darkening occurs one may expect a lightening and then a yellowish color to appear at the edges of the impressions under which the wings are forming. This yellow color comes from the yellow border of the butterfly's wings. After this warning sign the butterfly usually emerges in from two to ten hours. The ringed part at the top of the hanging pupa (the rings representing the future segments of the abdomen), begins to

lengthen, and when the membrane between the segments is tightly stretched, it becomes very bright in the three larger segments. Unless the pupa is disturbed, there is no sign of movement.

As revealed in the first picture on the preceding page, the pupa case suddenly splits along the line under which the antennae have formed. By pushing with the legs, the pupa is able to spring open its lower flap, and the antennae and mouth parts are pulled out. As the butterfly emerges, these two separate mouth parts are united by extending, coiling, and uncoiling to form the "double-barreled" sucking proboscis of the adult. With considerable pushing and pulling the butterfly now draws itself entirely out of the pupa case.

There is scarcely anything in the range of insect life that is more interesting than this rapid development of the butterfly after it emerges from the pupa. The wings of the newly-emerged adult are small and crumpled, but they are rapidly inflated. Circulation is aided by hanging with the wings downward and gently fanning them until they gradually attain more or less rigidity. The hardening of the wings takes several times as long as did their increase in size. The time that elapsed between the opening of the pupa case and the last picture on the preceding page was only about six minutes. Frequently the proboscis is rolled and unrolled, but its halves are kept together after they have once been united.

Our last picture shows two of the adult mourning cloaks on a spray of valerian. One is then impressed by the wonder of their development from the egg, caterpillar and pupal stages. No longer are their appetites so compelling as they were in the larval stage when quantities of leafy food were needed for growth; now the nectar of flowers suffices to replace the energy that is expended during flight. With the complete change in form has come a change in environment, for the adults are no longer restricted to the limited area over which a caterpillar can crawl, but are able to fly for miles, and to mate and lay eggs that will continue the race.

Nature's Gristmills

By EDNA P. HOFFMAN

Human beings have borrowed or copied the vast majority of their "inventions" directly from Nature. Consider our gristmills; where did man first get the idea for them?

The answer is lost in the remote past, but, after examining the pot-holes formed by one North Carolina river, it is not hard to believe that some clever savage observed rivers at work wearing pot-holes in the rocks and thereupon invented the mortar and pestle to grind his corn. From these primitive devices have developed the great gristmills of the present day. This, of course, is only a guess, but it does not take any great stretch of the imagination to reconstruct the picture when one actually sees the original process in operation.

Pot-holes are found in many parts of the world, wherever the river currents are strong enough to wear away rocks that lie in their beds. The holes are carved out at the bases of waterfalls or in eddies where the waters have swirled the pebbles about. Glaciers also make pot-holes by grinding steadily away with the stones they transport as they creep slowly down the frozen mountain sides. Stone grinds against stone, like a natural mortar and pestle, until even the hardest surface must give way before the constant friction and start the pot-holes.

An interesting and unusual group of pot-holes may be seen in the granite boulder-strewn bed of the Cheoah River in the Nantahala National Forest, North Carolina. For centuries the Cheoah flowed through the Great Smoky Mountains, rushing onward until it joined the larger stream of the Little Tennessee. Recently the Federal Government dammed many of the rivers in that vicinity to make the vast series of power dams known as the T.V.A. The Cheoah was one of them.

Now most of the Cheoah River's water forms the huge "made" or artificial Lake Santeetlah. Giant iron flumes carry the major portion of the water overland to the power plant several miles away from the lake. Only a thin trickle of water flows over the dam and follows the former course of the stream.

On the bare rocks, now lying high and almost dry in the river bed, may be seen traces of work done by the water during the ages it flowed unchecked over the granite foundations of western North Carolina. Hundreds of pot-holes have been formed, transforming once solid outcrops into worn and pitted objects. Some of these holes are two and three feet deep and the same in diameter. The massive stones themselves stand from three to four feet above the present water line

and are from five to eight feet long, weighing many tons. Year after year the stream swept over its rocky bed and around the boulders until shallow depressions were worn in their surfaces. Small pebbles caught in these depressions and, as the water flowed over them, they churned around, wearing themselves smooth and digging ever deeper into their rocky prisons.

Granite is one of the hardest of rocks, and is extremely resistant to wear. It does not chip or shatter easily and the author found it almost impossible to break the water-worn granite pebbles. Even when the pebbles were dashed as hard as possible against the larger boulders, they refused to break. Instead they bounced back with a mellow sound that was almost like the ringing of a bell. It must have taken centuries to grind such stones into their present shape.

The Cheoah River was originally about ninety feet wide at the point where the pot-holes are most numerous and the pitted rocks extend for several miles down the stream bed, which roughly parallels National Highway No. 129. Probably most of the outcrops were once submerged, because their edges and tops are worn smooth by the action of water. The quartz streaks through the granite have also been worn away.

In some places the pot-holes are cracked, allowing little trickles of water to leak out from them. The "grinders" inside the holes vary in size from small pebbles less than an inch in diameter to stones larger than a man's head. They are all worn smooth, into a wide variety of strange shapes, with no sharp edges left after years of

churning and grinding. Silt carried by the water has also been deposited in the holes where it acts like fine sandpaper in the process of polishing both cavities and grinders. The result is a surface of exquisite smoothness.

Pot-holes are well known to students of geology. Laymen sometimes call these natural gristmills "giants' kettles", and wherever they are found, pot-holes are always objects of curiosity, and graphic evidences of Nature's art.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

★

A MATTER OF VIEWPOINT

On two occasions in the past few months we have referred critically to matters involving wildlife conservation in Wisconsin. One related to the controversy surrounding an open deer season in that State last fall; the other to a published list of the game kill that showed certain species, including the red squirrel, listed as game and recorded as killed in large numbers. In both instances the Wisconsin Conservation Department has felt that we were unfairly critical—even prejudiced—toward a leading conservation State.

In both cases our comment was based upon principle. In the matter of the deer season (February, 1938, page 106) we have seen no evidence to prove that we were wrong in principle, however much the controversy locally may have been confused by politics and human frailties. In the last paragraph of our comment on the Wisconsin game listing (April, 1938, page 238) we may have been too harsh in phraseology, at the expense of the principle we were seeking to express.

We have watched the progress of conservation in Wisconsin with special interest. That State is in the forefront. It has taken the lead in requiring conservation teaching in the schools; its attitude on hawks and owls and on predator control has been an enlightened one; its refuge program has been excellent. In fact, we have regarded Wisconsin much as the school teacher regards the star pupil who consistently gets A in everything. When he slips back to D in any study her surprise and alarm are greater than with a consistent C-man. Wisconsin's Conservation Director, H. W. MacKenzie, feels that we have maligned a great State. That is the last thing we would wish to do, and one of the last States we would wish to malign is Wisconsin.

Our comments, and the protest they aroused from the authorities, give us an opportunity to point out why, at times, we may seem hyper-critical. The fact is that we find it difficult to place ourselves in the position of a conservation director. We find it a task to reconcile what we know to be right for the future of North American wildlife with the viewpoint necessarily imposed upon conservation administrators and administrations depending upon sporting license fees to carry on their work. In further elaboration of this principle as well as further explanation of our viewpoint, we feel it pertinent to quote the following statement on wildlife administration from the American Nature Association *Quarterly Bulletin.* We quote:

"The real insecurity of wildlife, the real weakness of our much vaunted State and Federal machinery for wildlife conservation, arises from the apathy of the majority of American citizens, who are neither sportsmen nor nature lovers, and whose interests and recreations are mainly in athletics and other amusements. These people have no real interest in the problems of wildlife, and are likely to oppose any effort to meet the cost of protecting wildlife through appropriations from general tax revenues. They leave the matter to the sportsman, and are unconcerned as to whether or not he, or any other agency, reduces wildlife more rapidly than it is replaced. This apathy results in part from the fact that the public is deceived by the claims of conservation progress made by the sportsman groups, who assume unlimited credit for endeavors that often fall ridiculously short of replacing even an appreciable percentage of the wildlife they destroy. For example, can anyone for a moment assume that the dollar paid for a 'Duck Stamp,' and used to restore breeding grounds, could result in replacing the number of waterfowl that the purchaser is thus authorized to kill? Yet the extravagant claims of the sportsman groups are quite convincing to the average citizen and are taken as proof that here is one type of public expense to which he need not contribute.

"Administration of wildlife resources through Fish and Game Commissions, Conservation Commissions and the like, is, unfortunately, greatly involved with politics. Since, as has been indicated, most of these bodies depend

for the major part of their income on fees paid for hunting and fishing licenses, their policies are naturally largely controlled by hunters and fishermen. One result of this system is seen in our sadly depleted stocks of game. Wildlife, however, is a *national* asset in which all our people have an equal right, and an equal responsibility.

"The principle of financing wildlife protection largely from funds contributed by sportsmen has now become a part of Federal administration, also. Thus, funds for the creation of wildlife refuges have been derived in part, for several years, from the one-dollar duck stamp required annually of some 600,000 waterfowl hunters. More recently funds for other conservation activities, to be shared with the several States, have been made available from the ten percent tax on arms and ammunition. We believe that while this principle has undoubtedly made more needed dollars immediately available for conservation projects, it also tends to deceive the public into believing that sportsmen can finance wildlife conservation and restoration without public aid. It places upon sportsman-controlled agencies the difficult if not impossible task of restricting fishing and shooting, when each act of restriction naturally operates to reduce the sale of arms, ammunition and equipment, and consequently the revenue from taxes thereon. Enforcement of more restrictions requires more money when less is available.

"If we Americans wish to keep our wildlife, we must prevent its destruction beyond its rate of increase, and this can be accomplished only by having both Federal and State conservation agencies so manned and financed as to be unprejudiced in their views. This means conservation agencies that need not depend upon the sportsmen as employers to be favored, but upon funds derived from the public treasury. State commissions not controlled by sportsmen alone could impose hunting licenses adequate to balance the destruction caused by hunting. To the extent that a Federal agency is dependent on sportsmen for funds, its freedom of action is restricted.

"From the administrative standpoint, the problem of wildlife is also a land-use problem too broad for the sportsman alone to manage. Particularly in the mountain States of the West, the needs of such species as deer and elk require that these animals descend during the winter months from the high forested areas and be allowed to graze on the lower ranges. Yet these same lower ranges have been pre-empted by man for domestic livestock and latticed with fences. This would be an unsurmountable answer from the practical standpoint if all of the lower ranges were really more economically valuable for domestic stock than for wild animals. But this is not the case, and winter ranges can be procured in many cases by purchase and transfer if an interested public will so demand. The justification for such expenditures cannot be found solely in the desire to produce more game to be shot, but in recognition of wildlife as a recreational asset that attracts thousands of visitors to public resorts, ranches and camps where recreation has become a business that brings in millions of dollars each year—a business as worthy of Federal and State encouragement as any other form of industry. Thus wildlife is really a public resource to whose management the whole public should contribute, even though the sportsman should pay his *full* share.

"In brief, the American Nature Association endeavors to promote a public attitude that will demand an honest balancing of our wildlife budget in complete fairness both to sport, and to the recognition of wildlife as a vital natural resource with predominant recreational, esthetic and economic values."

SOME CROW VIRTUES

A good word for the crow is contributed by Karl W. Kahmann in a letter addressed to the Wisconsin Conservation Department, and published in its *Bulletin* for April 1938, pointing out that the crow, as regards harm and good, is about a 50-50 proposition, but that only because man has created conditions "favorable to bringing out the crow's destructive traits," Mr. Kahmann, after a lengthy discussion, concludes as follows:

"To sum the whole thing up—certainly the crow should not be given any such protection as we have and need for most of our wild life. On the other hand, no poison-campaign, dynamite, crow-shoots or other special forms of destruction would seem to be needed in a general way. Where the crow population is found—by capable and impartial investigation—to be such that it warrants special measures, these should be carried out under proper supervision.

"Crow-shoots always remind me of some of the Indian war dances, where the young braves work themselves into a frenzy of blood-lust and killing before the event, and then try to outdo the other fellow by shooting every living thing in sight; be it a crow or one of our fast-disappearing beneficial hawks or owls, one of the many varieties of protected sparrows (so long as he is a sparrow of some kind) and—what not?

"Bounties make for killing even where there is no great congregating of objectionable species and are responsible for the killing of many birds who nest far from human habitation and are 'minding their own business' instead of only those individuals who have fallen into the habit of eating at the farmer's ample table.

"Poisons are altogether too dangerous to forms not being campaigned against, and not selective, which holds good for traps as well, unless they be of a type where those species not to be killed may be released.

"Dynamite and such practices as Illinois is employing are purely 'stage play' in my opinion, and indulged in where a conservation department wishes to please their sportsman backers, regardless of the need or advisability of the procedure.

"Let's have the crow for a legal target at all times of the year—let the sportsman keep them down all he wishes, because this will mean that they will be killed where they are the most plentiful—but—let's not kill them too near the point of extermination (the crow can take care of that, I am sure) and—let's not forget altogether their good side and that they are here for a purpose."

TRAILSIDE MUSEUM AT PALISADES INTERSTATE PARK
Easily accessible to the visitors to this reservation, it successfully introduces thousands to the fascination of Nature

Bear Mountain Museum

Nature lures many at Palisades Interstate Park

By LORINE LETCHER BUTLER

Photographs from American Museum of Natural History

WHEN the picturesque Hudson River steamboats dock at Bear Mountain on a bright summer's day, throngs of pleasure seekers disembark—people from New York and its vicinity who have come to spend a day under the trees and on the grassy slopes of Bear Mountain Park, a part of the Palisades Interstate Park. Like an army the procession climbs the winding path that leads up the mountain to the picnic grounds and the inviting rusticity of Bear Mountain Inn.

At the top of the incline, where the visitor stops to get his breath and decide which of the alluring paths he will follow, there is the sign, appropriately framed in wood and elevated on bark-covered poles—"TRAILSIDE MUSEUM AND NATURE TRAILS." Thus, almost upon their arrival at Bear Mountain the 40,000 or so visitors—an average Sunday crowd—are invited to enter the Trailside Museum. Although there is nothing in the museum, or along the trails, that is not native to the region of Bear Mountain, the plants, animals and birds, are effectively collected and exhibited to stimulate the visitor's interest.

The Trailside Museum is also so situated that it invites passing motorists, guests who arrive at Bear Mountain Inn by train, and hikers through the Park. So, as an educational institution sponsored by the American Museum of Natural History and the Palisades Interstate Park Commission, the Trailside Museum could not be better located for reaching the greatest number of the visiting public.

In reaching this public the Trailside Museum operates on the assumption that the same methods are effective with many types of visitors. William H. Carr, director of the museum, says that "the so-called scientific mind is possessed by relatively few people, whether they be fortunate or unfortunate as regards personal wealth or mental ability."

The antics of the raccoons in their cage, or the friendly overtures of Caroline, the gray fox, delight visitors of all ages and every station. Labels on exhibits and along the Nature trails in the woods surrounding the museum are worded briefly, simply and entertainingly. For example, the newts are labelled: "These salamanders can float in water without swimming movements. When several get hold of one worm at different points they have a grand time pulling and tugging until the poor worm gives up and breaks into convenient pieces."

Of unfailing interest is a sign recommending baking soda as a remedy for poison ivy—a patch of poison ivy modestly standing by for identification. Sometimes a personal tone is introduced: "How many fingers have you? This plant is named cinquefoil or five fingers. It has five leaflets." Or: "You may say you know nothing about trees. You must know something. Something is a good beginning—a fine starting point for tree knowledge." And many trees are labelled with interesting bits of

ALONG THE NATURE TRAIL

Attractive markers identify the many things of interest, and stimulate the inquiring mind

knowledge important for identification, such as the seed-throwing habit of the witch-hazel, the dark triangles beneath the branches of the gray birch, or the three leaves in a bundle of the pitch pine.

The labels themselves are unobtrusive and attractive, being of durable metal painted in olive green with black lettering. In fact, so unobtrusive are they that it is part of the game often to make the passerby look for the label. The hidden label—one concealed by a weighted cover that the reader must lift before viewing the sign—is an appeal to human curiosity.

The "do-it-yourself" idea is frequently employed. It has been found that people give more attention to some exhibit that requires a bit of effort on their part than to one that stands forth begging to be noticed. Geological specimens are placed within tricky receptacles that must be opened, or revolved, or lighted, before disclosing their contents. And these devices focus the flickering public attention that wanders carelessly by a neatly-labelled shelf.

An exhibit that permitted the visitor to fetch his own pail of water from a nearby pond—in a thimble-sized pail provided for the purpose—for investigation beneath the microscope proved to be a popular Fourth of July attraction. The microscopes held their own with the shooting gallery and the noisier diversions in the adjacent amusement section of the Park.

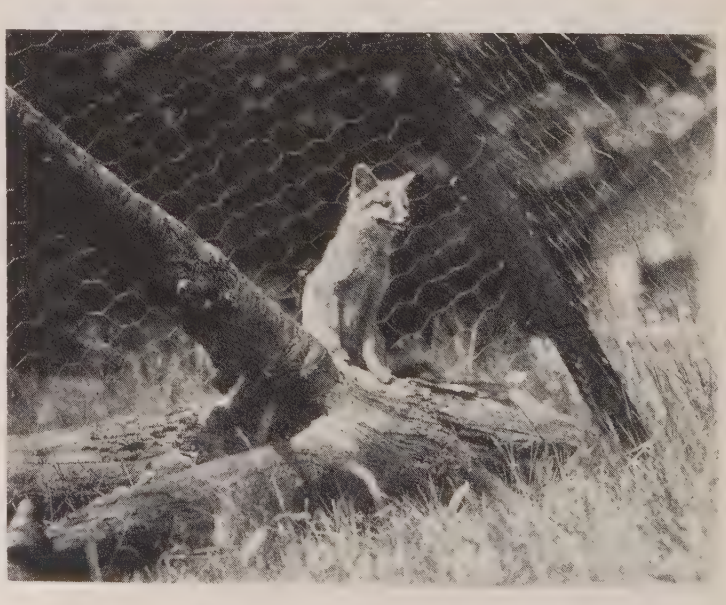
The Bear Mountain Trailside Museum is the largest Nature museum in the country, having grown in eleven years from the single building constructed in 1927 with a gift by the Laura Spelman Rockefeller Memorial to a group of five boulder-clad buildings, wherein living collections of mammals, birds and plants, and a geology collection, are shown. "Covered trails" the museums are called, as their purpose is to furnish a general survey of the natural history of the surrounding country.

Many of the exhibits are changed with the seasons, the museum being open throughout the year. In the botanical section there is a constant procession of plants, from the miniature marsh in the spring to the display of fall and winter berries. Wild flowers are always on hand for identification—those that are to be met along the Nature trails or in the Park.

"Transient guests" in the Trailside Museum are the toads, which make a brief visit and are released to go about toad affairs. Snakes, snails and salamanders stay on to tell the story of life development to an interested public. The red-bellied snake climbs the glass front of its cage and obligingly exhibits its red belly. A pair of green snakes pose, a lovely necklace of jade. The timber rattlesnake shakes his rattles before an awed audience.

Outside, among the open air exhibits, the snake pit, where full-grown specimens of harmless varieties are at home, affords needful information as to the usefulness of snakes. In the zoo—a collection of animals indigenous to the region—elk thrust friendly noses through the wire netting about their enclosure, and the wild cat watches the sparrows fluttering about, or scratches his ear with a hind foot like any household tabby. Next to the park swimming pool is the bear pit, where sophisticated bears watch the antics of bathers—or *vice versa.*

Among the bird exhibits a great horned owl glares belligerently at the world from the depths of his roomy outdoor cage. The barred owls are friendlier, gazing with their mild black eyes, or hippety-hopping in their awk-



AN ALERT GRAY FOX

A small zoo houses birds and mammals indigenous to the region of the Park

MUSEUM INTERIOR
All exhibits are carefully marked with informal labels inviting further investigation

ward gait for closer acquaintance. The crow in the next compartment is positively cordial. Crows at the Trailside Museum are favorite birds. On a grass plot near the bird cages there is a small wooden grave marker with the inscription: "Here lies Joe the Crow, educational ambassador from the kingdom of birds. Friend of thousands at the Trailside Museum. June 1929—August 1936."

A worthy successor to Joe is Archie, the present crow pet at the museum, who caws unexpectedly at visitors at some turn of a trail, and stalks superciliously about the floor of the museum.

One of the most interesting sections is the historical museum, in which are displayed relics of the Revolutionary War and those of the earlier day of Indian occupation. The Trailside Museum stands on the site of Fort Clinton, where Orange County farm boys defended themselves against a British attack in October, 1777—holding their fort until overwhelmed by superior numbers. Inside glass cases there are piles of cannon balls and bullets that have been excavated on the premises, buttons from Revolutionary uniforms, bayonets, and other mementoes.

In the Historical Museum is housed, too, the Hyde Memorial Library, a reference library pertaining to natural history and American history. This is dedicated to the memory of "Uncle Bennie" Hyde—Mr. B. T. Benjamin Hyde, who established the first outdoor museum in the Park and was a leader in the movement for outdoor education.

The yearly increase in visitors to the Trailside Museum is evidence of the success of the project. By hundreds of thousands they come—from every state and from thirty foreign countries. While the Trailside Museum serves as a model for similar enterprises throughout the world, yet, Mr. Carr declares, "our work has barely commenced."

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SEA GULLS

By ELEANOR ALLETTA CHAFFEE

What are the sea gulls searching for
As they ride on the wind's slow tides,
Back and forth in their circling flight
With their gleaming ivory sides?

Mirrored in crystal water clear,
What do they hope to find
Deep in the caverns of the sea,
In silver and coral signed?

Do they seek there a sunken city,
The flight of a shadowy bird,
An echo of something stranger
Than ever before was heard?

What are the sea gulls searching for
Over the waves, beyond the shore?

Things to Think About

It appears that we were somewhat premature in our editorial assumption that the bill to reorganize Federal departments would be passed by the House of Representatives. Its defeat, when we went to press, was considered a remote possibility, but a tide of vociferous opposition, on grounds apart from conservation, shelved it.

• • •

The importance of community forests as a local asset is described in a new circular just issued by the United States Forest Service and entitled *Community Forests.* Such areas, once established and matured, may become a source of income for the local government, a means of providing employment and of producing local timber supplies at a reasonable cost. The leaflet is available from the United States Forest Service, Department of Agriculture, Washington, D. C.

• • •

On the front page of his paper the editor of the Kern County, California, *Union Labor Journal* conducts a column of comment and ideas. Recently he led this column with the following suggestion:

"One way to protect the wild birds from needless suffering and slaughter might be to have a Federal law passed compelling the sellers of air guns and rifles of all kinds to deliver to the buyer and take his receipt for, a notice or some Government publication calling attention to the value of bird life. The receipt taken from the buyer might include a pledge that the gun will not be used to destroy the feathered friends of mankind."

We assume, of course, that the editor is thinking of our song and insectivorous birds that are protected by law, but that are killed in great numbers by boys and men equipped with air guns and light rifles. We would go farther, for we believe that all air guns and rifles should be kept out of the hands of boys because of the wildlife destroyed, and especially because of the appalling total of persons blinded, maimed, or killed that results from the use of such arms in the hands of the inexperienced.

• • •

Conflicting views between the United States Forest Service and the National Park Service having been reconciled, indications are that progress toward creation of the Olympic National Park will be easier and more rapid. As now agreed upon the proposed Park would total 927,160 acres composed of the present Mount Olympus National Monument of 322,000 acres; the National Forest Primitive Area of 218,639 acres; additional National Forest land of 327,278 acres; private lands to be acquired of 21,646 acres, and an ocean strip comprising 37,597 acres.

Urging the creation of this Park and hailing the agreement between the two Federal agencies involved, the New York *Herald-Tribune* comments editorially as follows:

> To the public at large it may seem more or less of an academic question as to whether such an area be under the control of the forest or the park service. Both are government bureaus concerned with conservation. The difference lies in the fact that the park service has as its principal duty the preservation of natural beauties in their original form, so as to prevent their desecration and destruction by mankind, whereas the forest service has as its prime purpose the conservation of forest resources for ultimate commercial consumption—which means that the cutting of timber under government regulations is part of the forest service policy.
>
> It is because, under this policy, forest areas, no matter how beautiful, may be cut if they are under the control of the forest service, that friends of conservation have wanted to have the Mt. Olympus area set aside as a national park. The mountain itself and its lakes and ridges are exceptionally spectacular in a region rich in scenic beauties. The new Wallgren bill, by including most of the finest timber within the new park boundaries, would add to the national park system a forest area unsurpassed anywhere in the United States.

• • •

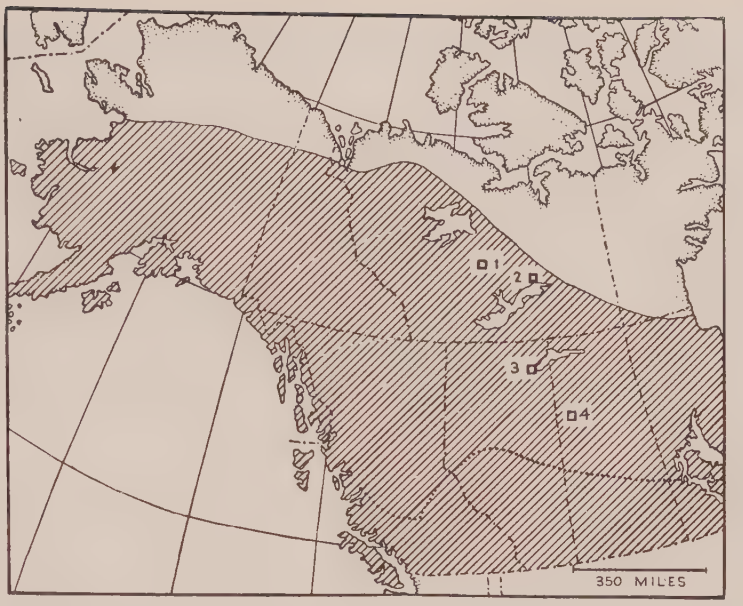
In twenty-five Wisconsin counties a total of 1,746,647 acres are now in county forests. Guaranteeing a future supply of timber, valuable in protecting water supply, serving recreational purposes and containing economic promise for the future, this program is an inspiration to other state subdivisions with large areas of sub-marginal, tax-defaulted lands on their hands. The program is described in an attractive booklet entitled *The County Forests of Wisconsin* and published by the State Conservation Commission at Madison.

• • •

The Florida Forest and Park Service has recently brought out the fifth edition of *The Scout Forest Handbook,* originally issued in 1933 to further an excellent forestry program of the Boy Scouts in that state. The results of this project during a five-year period have amply proved the possibilities of building up a conservation consciousness among the boys, thus creating a guarantee for the future.

• • •

As reported in these pages, many Vermonters have been up in arms at the invasion of the billboard interests into rural areas of that state. Organization of citizens has resulted, coupled with protests to advertisers using these rural boards. An interesting commentary on the effect of public opinion appears to exist in the records of the Secretary of State of Vermont, which show that, in the six months between October 1, 1936 and March 1, 1937, there were 64 applications for new billboard locations and 276 applications for renewals; while from October 1, 1937 to March 1, 1938 there were no applications for new locations and 11 applications for renewals.



Here is shown the breeding ground of the ducks and geese of western Canada and Alaska, for no region is without some species. The lined area shows the nesting area of the mallard, and nearly the same range is occupied by the pintail, green-winged teal, and Canada goose. It is highly significant that these four species, which have held their numbers against overshooting better than other waterfowl, have extensive breeding grounds north of the region of intensive settlement, agriculture, drought and sport shooting. The broken line shows the northern limit of most of these phenomena. The drought area is not far to the south.

The numbered squares (1, 2, 3, 4) each cover 1225 square miles, and is typical of an immense region. Some details of these areas, taken directly from an official map based on topographical surveys and aerial photographs, are shown on a succeeding page. On these little maps only a small percentage of the ponds could be indicated. This is proved by a careful examination of more detailed large-scale airplane maps of comparable areas, which reveal on *each square mile,* in many cases, a dozen or more ponds too small to appear in our reproduction, but which, nevertheless, are capable of supporting from one to a dozen or more pairs of nesting ducks.

Considering the natural advantages and the immense area of this great nursery, it is difficult to overestimate its potential capacity. These myriad lakes and marshes are in a region where Nature, all through the thousands of years since the ice retreated, has built up and provisioned breeding grounds capable of producing each year untold millions of waterfowl; its resources of food and shelter are still unimpaired and it lacks only a sufficiency of breeding stock to give it almost limitless productivity. No area of similar size on the earth surpasses it.

With this vast nursery relatively untenanted (when one considers its possibilities) how futile are man's efforts for improvements! The dictates of common-sense and mercy demand that it be rehabilitated by the only sure method—respite from the gun.

WILD DUCKS IN CANADA

By TONY LASCELLES

It has been the unhappy experience of the past that when organizations directed and controlled by laymen and generously financed by commercial interests have attempted to restore wild life populations for the sole purpose of meeting the immediate demands of sportsmen and the aspirations of allied manufacturing interests, their efforts have invariably defeated the ends they sought to attain.

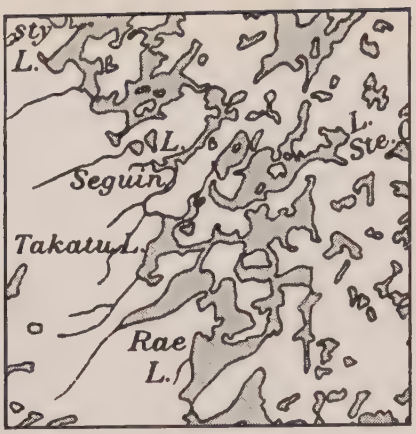
At the present time, an international organization of the sporting fraternity (Ducks Unlimited—Canada) is formulating an ambitious program designed to restore depleted waterfowl populations, especially the more edible species of ducks, in order to satisfy the gunners of the United States and Canada, and, incidentally, to keep the sale of ammunition and other sporting accessories on an even keel. The restoration of the breeding areas in the drought-stricken parts of Western Canada, and other efforts to restore what we have destroyed through the years, are expected to crowd the skyways with countless whistling wings.

While it is perhaps too early to speak with authority regarding what benefits will derive from a policy that seeks to restore a pitiful remnant of waterfowl to the generous proportions of other days and at the same time permits millions of scatter guns to deliver a withering hail wherever they abide, one may, nevertheless, wonder by what miraculous means sportsmen can hope to outwit the laws of simple arithmetic and defy the elementary decrees of Nature.

Long lines of "paying guests", at ten dollars for fifteen ducks, crowd commercial abattoirs in the United States to pour gunfire into bewildered flocks of migrants, scared from privately-owned baited areas for the purpose of slaughter, and cold storage houses preserve thousands of canvasbacks and redheads to be sold at fancy prices to men of wealth and standing. And, to our shame, the American market hunter still plies his nefarious trade almost within sight of the Washington Monument, still using a huge market hunter's gun, outlawed, but still active.

One might also mention the negative enforcement of the Migratory Birds Convention Act, breeding crime and every form of evasion. Even "conservation leaders" appear in court charged with infractions of the duck laws, leaders who advocate and support the proposed new program. "Business as usual" appears to be the war cry of the sporting clans, a business worth about two hundred million dollars annually, a business that will not be denied its "rights" even in the face of disaster.

It is indeed unfortunate that a degree of insincerity should dominate the conservation creed of practically every North American sporting organization, and the various sporting publications whose chief concern is advertising rather than orderly recovery. And the latest faction in the field appears to be no exception. In any event,



1—This area, typical of many thousands of square miles, is especially valuable breeding ground for the surf scoter and greater and lesser scaups. It is also the home of many Canada and white-fronted geese, and the green-winged teal, harlequin duck, mallard, pintail and widgeon.

2—The surf and white-winged scoters, Canada and white-fronted geese, mallard, pintail, lesser scaup, and old-squaw occupy the region north of Great Slave Lake in the nesting season. This area represents a vast region. The dotted line marks the limit of trees.

modern biological practice, non-existent in sporting organizations, considers that exploitation should be incidental to conservation, and not the reverse.

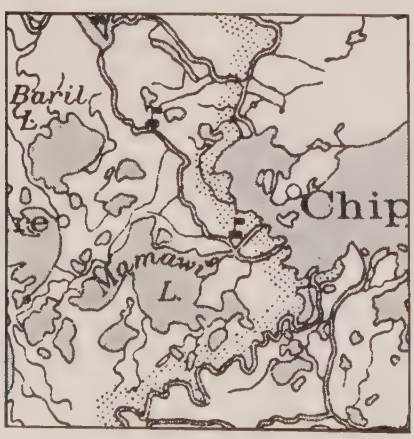
No policy is sound that overlooks, among other things, the necessity of restoring depleted game populations before even a measure of renewed hunting is allowed. The naïve belief that it is possible to control the slaughter of a form of animal life whose range covers almost the length of the continent during the fall and early winter, and at the same time restore it to normal population levels while it is subjected to the death-dealing hazards of millions of guns, is not only biologically unsound but an obvious impossibility. And this is apparently the insecure foundation upon which the new organization bases its policies.

Is there any wonder that a host of non-hunting conservationists and Nature lovers, and a certain class of hunter with a biological knowledge of the wilderness and its ways, are fearful of the activities of such organizations? Other game birds and mammals have been victims of the concern of commercially-assisted lay organizations. There is little hope of restoration if the candle continues to be burned at both ends.

It is not too early to criticize certain policies in attempting to disprove the assertion that the major contributing factor to the decline in numbers of waterfowl is lack of water, and that the restoration of prairie breeding areas will assure a generous addition of waterfowl populations. In the first place, the thousands of grassy sloughs and rush-lined marshes, the original habitat of prairie-loving species, were erased by the plow many years ago. Strange, is it not, that the decrease has continued season after season without abatement?

The modern conservationist believes that super-destruction is the cause, the slaughter of parent stock and increase alike. And as for the doubtful possibility of restoring water, food and natural cover to more than the merest fraction of these drained, eroded, dust-filled and semi-cultivated depressions, one may say in all sincerity that the proposal is the armchair dream of a boudoir theorist rather than the plan of a competent field biologist. In any event, the value of their re-creation depends entirely upon the supply of birds, for of what use are resurrected breeding areas without prospective tenants? And after all, one cannot create a supply of living ducks from the muzzles of millions of guns.

The belief that the shortage of waterfowl is caused by the general absence of water is another fallacy quickly exploded should one care to survey intelligently the sloughs, pot-holes and marshes of the near North where there is ample room, water, food and breeding shelter to accommodate countless thousands more waterfowl, the normal population of former days. Why worry about drought-stricken prairie regions when a generous environment, already occupied by the surviving remnant of prairie-breeding ducks that of necessity changed their habitat, awaits the opportunity again to produce? Surely we cannot attribute the pitiful deficiency of canvasbacks, redheads and other deep-water varieties to lack of accommodation when the deep lagoons and marshy bays beyond civilization's rim emptily await their return; let us remem-



3—In and about this great delta breed a great variety of waterfowl, including Canada and white-fronted geese, blue-winged and green-winged teals, bufflehead, canvasback, goldeneye, pintail, redhead, lesser and greater scaups, shoveler, surf and white-winged scoters, ringneck, ruddy duck, and widgeon.

4—The Canada goose, bufflehead, goldeneye, widgeon, canvasback, redhead, ringneck, ruddy, lesser scaup, and blue-winged and green-winged teal raise their young by thousands in this region, just north of the drought area.

ber also that practically every bird that survives the arduous journey from the South, on its way to breed within our borders, accomplishes its purpose. The blasts from the muzzles of millions of guns tell the story of depletion with far greater sincerity and plausibility than an ill-considered human invention. Waterfowl, not water, is the crying need of the hour.

With this in view, one naturally wonders why any organization should plan an extensive campaign in an attempt to build up a remnant population of waterfowl while the guns continue to take their excessive toll. It is undoubtedly a magnificent gesture, but a gesture without biological significance—a red herring across the trail.

Every wilderness biologist is aware that the only practical way to restore the population of any species of animal life suffering from excessive exploitation is through the medium of closed seasons extending over a sufficient number of years. A Utopian suggestion, to be sure, and rather out of place in an age that apparently believes one can continue to enjoy the whole cake while devouring the last of the crumbs. Is it any wonder that the aspirations of the new international organization are considered insincere by a host of non-hunting conservationists, Nature lovers, and a certain class of hunters? The federal and provincial governments, with the necessary expert assistance, are the proper agencies to take this matter in hand.

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To a Golden Eagle in a Pet-Shop Window

By ROSALIE EDGE

Might I as Byron sing, all hearts to sear,
  And flame to wrath against thy "vile repose",
O Eagle, proudly dumb, alert with fear,
  Indifference and Ignorance thy foes!

To Bonnivard the sunlight was denied,
  His woe was cloaked in silent solitude;
Thou seest envied clouds wind-horses ride,
  While round thee gape the curious and crude.

The mocking statutes of a sovereign state
  Decree thee wild, O Golden One, and free,
The while her servants ignorantly prate
  Of Education in captivity.

Symbol of power and truth, can wisdom's light
Shine forth from hearts that deem base evil Right?

•

A Scenic Stamp

By EDITH M. LANG

REALIZING how widely postage stamps travel, New Zealand is advertising its natural attractions through artistic postal pictures. The central design of the accompanying stamp is New Zealand's highest peak, Mount Cook, 12,349 feet high, officially named for the discoverer of the islands, but otherwise known by its more picturesque Maori name, Aorangi—the Sky Piercer.

Holding court among an imposing array of satellite peaks, snow-crowned Aorangi dominates the Southern Alps, which extend almost the full length of the South Island. Cradled on its mighty bosom are dazzling glaciers. Its grandeur was first brought to the attention of the outside world by the German scientist, Julius von Haast. Since then many mountaineers have pitted human pluck and stamina against the monarch's granite steeps and perpendicular ice-walls, sudden tempests and obscuring clouds, yawning crevasses and treacherous avalanches.

Conspicuous among the varied alpine plants of the mountain chain is the particularly beautiful *Ranunculus lyalli,* shown bordering the stamp. In the summer months of December and January, the alpine meadows from 2000 to 5000 feet are carpeted with these lovely shepherd or mountain "lilies", which are, of course, in reality buttercups of giant size. Vying with the snow in purity is the whiteness of their satiny petals radiating from a golden heart. The saucer-like leaves of shining green are often a foot in diameter.

Visits with Western Alpine Flowers

Rocky Mountain Park aud Pike's Peak provide fine wild flower gardens

By WARREN C. WILSON

Photographs by the Author

MANY tourists spending their vacations in the high mountain areas of the West have made a startling and pleasant discovery. Even some who have driven to the summit of Mt. Washington in New Hampshire, and then strayed a short distance from the road, have been pleased by a similar unexpected revelation. More than once while visiting such an ostensibly barren summit I have heard such remarks as: "Oh, I didn't know that pretty flowers grew in *these* rocks."

It is in this way that many persons are introduced to alpine plants. If they are amateur gardeners, they may dig up a few plants, probably leaving most of the roots behind, and carry them home to their gardens. Unless, through improper packing, the plants have already dried out, they are carefully planted, usually in the wrong exposure and improper soil. Then there is surprise, in a week or so, that they have died. So perishes many a beautiful alpine that, with proper handling, would thrive in another garden.

It was my good fortune, during the summer of 1936, with an interested companion, to be able to visit some of our western alpine regions. The particular purpose of the trip was to study and collect native alpines, and to talk with nurserymen who specialize in growing these plants.

After several trips during the past few years to the highest eastern summits that support a limited alpine flora, it was logical to turn towards the West with its great number of alpine species. I felt justified in planning to remove a few of these alpines from their native habitats, because they were to be used later in culture and propagation experiments at Cornell University.

TYPICAL COUNTRY OF ALPINE GARDENS

Many people on their first visit are surprised to discover the floral beauty displayed above the tree limit (Photograph by A. Wilson)

THE ROSE OR QUEEN'S CROWN

The pink flowers of *Sedum rhodanthum* grow in clusters on foot-high stems in moist places, and are most abundant at or below timberline

With the growing interest in true rock gardening (not the common dog-cemetery type), there is a corresponding rise in the demand for new and better kinds of alpine plants. This has been met by the introduction of many European and Asiatic alpines. Even though a great number of these are commonly used in England, Germany, or other foreign countries, the results with a large percentage of them here have been far from gratifying. Our rock gardeners are now turning to American plants. It is up to interested and experienced individuals, and horticultural institutions, to satisfy this desire for *worthwhile* new plants and *trustworthy* information about their culture and propagation. With this object in mind we started West!

Rocky Mountain National Park, in which we had permission to collect, was the first area visited. This section of the Colorado Rockies rises to heights of more than 14,000 feet in many places, and has an unusually diversified and interesting flora. One can now drive up a well-paved and graded road on Trail Ridge to an elevation of more than two miles above sea level. It is necessary to step only a few feet from the car to see the alpines at their best.

On our first day above treeline (in mid-July) it snowed, covering most of the plants. The tall white spikes of the alpine bistort, *Polygonum bistortoides,* still stood above the hidden alpine turf. The bistort is one of the most common alpines in that region. It is unusual because of its relatively great height, often two feet, in a zone where most of the plants rarely reach six or eight inches.

The extremely large heads of the little-old-man-of-the-mountain, *Actinea grandiflora,* presented a bedraggled, forlorn appearance after having been buffeted about by the wind and snow. It is a striking plant with yellow, daisy-like flowers frequently three inches in diameter held only six inches, or less, above the ground.

On a more sheltered slope to the south, where the snow had melted somewhat, we had our first glimpse of the dwarf plants. The minute, moss-like mats of the alpine sandwort, *Arenaria sajanensis,* still had a sprinkling of white flowers. Here and there the equally dwarf cushions of that widespread alpine, the moss campion, *Silene acaulis,* showed a few pink flowers. It was not long before we discovered a real mountain gem. On a bed of coarse chips beside a boulder was the bluest flower we had ever seen—the alpine forget-me-not, *Eritrichium elongatum argenteum.* Its brilliant sky-blue flowers with their yellow eyes set on a tiny hairy tuft of silver is to be long remembered.

YELLOW ALPINE SAXIFRAGE ON ICE

A hailstorm on Pike's Peak is no hardship to these flowers with their intense yellow, red-spotted petals. *Saxifraga chrysantha* inhabits the southern Rockies

THE BEAUTIFUL ALPINE FORGET-ME-NOT

This is among the bluest of all alpines

Our ascent of Trail Ridge two days later was made under clear, sunny skies and over a flower-carpeted alpine turf. The yellow stonecrop, *Sedum stenopetalum,* was much in evidence, as it was in full bloom. This cosmopolitan little plant extends from the dry areas of the montane zone to considerable altitudes in the alpine zone. The pinkish alpine clover, *Trifolium dasyphyllum,* formed mats that covered large spaces. The alpine avens, *Geum turbinatum,* is probably the most abundant alpine in the Park. It has buttercup-like flowers over dark green, finely-cut foliage. Another fairly common plant of the higher altitudes was the snowlover, *Chionophila jamesii.* With its creamy spike of two-lipped flowers, it fooled me into believing it was perhaps a dwarf pentstemon.

I was surprised to find a miniature lily, *Lloydia serotina,* the alpine lily, distinguishable by its narrow, fleshy leaves and creamy flowers with brownish stripes on the outside. Occasionally in the rocks we found the whiplash saxifrage, *Saxifraga flagellaris,* with its large, yellow flowers, which kept us from carelessly missing it. This small alpine reproduces itself by throwing out from its rosettes slender runners with microscopic plants at their tips. They touch the ground and root, much in the manner of straw-

ALPINE BLUEBELLS

Mertensia alpina is a mountain lover. The plant at its base is *Trifolium dasyphyllum*

berries or hen-and-chickens. Frequently the showy draba, *Draba streptocarpa,* was found growing with the saxifrage. This yellow-flowered member of the mustard family produces peculiar twisted seed pods.

The alpines mentioned so far are mostly those indigenous to the usual type of habitat found above treeline, that is, the exposed summits or slopes with many outcroppings of bedrock, various sized boulders split from the parent rock, and stony, gravelly, porous ground covered in places by the accumulating layers of organic matter. There are, however, a limited number of moist, boggy places that offer conditions suitable for a different plant association. Among the prostrate willows and other woody plants one regularly finds several showy herbaceous plants. Of these, the elephant's head, *Pedicularis groenlandica,* is to me one of the most interesting plants found in the West. Each small flower of the dense spike rather accurately simulates an elephant's head, complete with long, upward-curving trunk, broad, bulging forehead, and widely extended ears. The flowers are reddish-purple and the fern-like leaves have a purple cast too. The plants grow to about six inches in the alpine zone but taller in the sub-alpine meadows.

PARSLEY FERN GROWS IN ROCK CREVICES

Below, an interesting western alpine, the elephant's head, each flower a miniature head, with trunk, forehead and extended ears

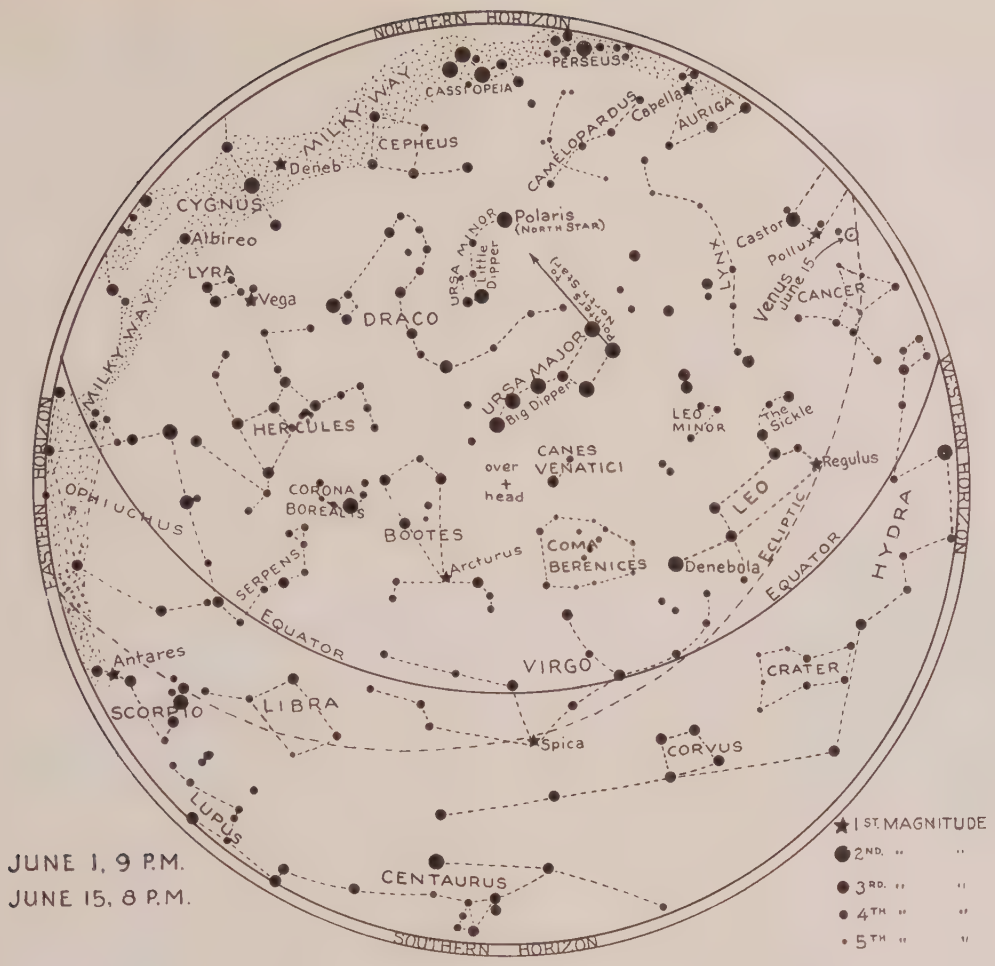
Two sedums customarily grow in wet places such as these. The rose or queen's crown, *Sedum rhodanthum,* with pink flower clusters on foot-high stems and light green leaves, is most abundant at or below treeline. The king's crown, *S. integrifolium,* has beautiful deep reddish-purple, sometimes almost reddish-black, blossoms. Its stems are only eight inches tall, or much less at high altitudes, and the leaves are light gray-green.

The tiny bitterroot, *Lewisia pygmaea,* is the solitary member of that genus found far above treeline in the Park. It is not a conspicuous member of the flora, but its delicate pink flowers and succulent linear leaves have a decided charm of their own.

Before traveling south through the heart of the Rockies to Pike's Peak, our next point of call, I think that I must mention two more plants that we saw in Rocky Mountain National Park. Restricting my remarks to just two is indeed difficult with such a myriad of other beautiful and interesting alpines perhaps deserving equal attention.

The first is the snow buttercup, *Ranunculus adoneus.* It is encountered as one tramps along the edge of melting snowbanks. There it is conspicuous with its finely-divided leaves and large yellow blooms, at times even poking up through the snow. The second, the parsley fern, *Cryptogramma acrostichoides,* grows at its best in the shaded rock crevices of the sub-alpine zone, but does occur higher. This fern is somewhat unusual because it produces two distinct types of fronds. One, the sterile fronds, form a fringe or collar around the base of the plant; the other, the fertile fronds, which bear the spores, grow upright in the center forming a distinct tuft. The parsley fern is about eight inches high and decidedly yellowish-green in color.

Pike's Peak was a surprise to me. Because it is more than 14,100 feet in height, I imagined its summit would be covered by perpetual snow. Instead, it is a tumbled mass of huge reddish-brown rocks. I had heard of it in connection with scenery, history, auto races, and the like, but never because of its alpine flora; so another surprise awaited me when I stepped from the car and saw the large population of alpines, almost all in full bloom. It was a marvelous outdoor flower show, made more interesting by a fresh fall of hail. (Continued on page 377)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

IN SUMMER SKIES

By ISABEL M. LEWIS

By the beginning of June nearly all of the brilliant constellations with which we have become so familiar during the winter months have disappeared from the evening sky. In the northwest Capella still lingers for a brief period, and, also, Castor and Pollux in Gemini, but soon they also are gone. One may search the heavens in vain for Orion or Taurus, Canis Major or Canis Minor. The brilliant Rigel, Betelgeuze, Aldebaran, Sirius and Procyon are gone until the return of autumn, and in their place we have the softer radiance of the summer stars. The constellations that appear in the evening sky in June and July include, however, the well-known Ursa Major and Ursa Minor with their Big and Little Dippers, respectively, and Cepheus, Cassiopeia, and Draco in the northern sky. These circumpolar constellations, as they are called, never pass below the horizon in the mid-latitudes of the northern hemisphere. On any clear summer night we may see the W in Cassiopeia on the opposite side of the pole from the Big Dipper in Ursa Major, with Polaris, the Pole-star, at the end of the handle of the Little Dipper in Ursa Minor, nearly midway between The Pointers of the Big Dipper and Beta Cassiopeia, the leader of the stars in the W in their east to west motion. Draco is one of the most interesting of these circumpolar constellations. Its long curved line of third and fourth magnitude stars lies between the two Dippers and north of the constellations of Lyra and Hercules. The tip of the Dragon's tail is on the line between the Pole-Star and The Pointers of the Big Dipper, while its head is marked by a small group of four stars that lies beneath the foot of Hercules, The Giant.

The huge constellation of Hercules is one of the finest constellations visible in summer skies although it contains no stars brighter than the third magnitude. It lies between the two small constellations of Lyra on the east, which is easily identified by its magnificent diamond-like Vega, and the beautiful little circlet of stars on the west known as Corona Borealis, The Northern Crown. To the north of it is Draco, whose head lies beneath the Giant's foot. To the south of it is the enormous constellation of Ophiu-

chus, The Serpent-Bearer. The star of second magnitude, Alpha Ophiuchi, that marks the head of Ophiuchus, lies very close to Alpha Hercules in the head of Hercules, which is the fainter of the two stars. In Hercules, in the position indicated on the map, lies the magnificent globular star cluster, more than thirty thousand light years distant from the earth, known as Messier 13. In this Great Hercules Cluster, as it is generally called, lie thousands of brilliant points of light apparently closely packed together although actually several light years distant, at least, from their nearest neighbors. Most of these stars are a hundred or more times more brilliant than our own sun. More than one hundred of these great clusters have been observed and their distances from the earth determined. The Hercules Cluster, which is faintly visible even to the naked eye on a clear, moonless night, is one of the finest of these objects.

Vega, in Lyra, and Arcturus, in Bootes, are the two most brilliant and beautiful stars visible in summer skies. Although they are almost equal in brightness they differ greatly in color. Vega has been compared both to a diamond and a sapphire and also has been called "the arc-light of the sky". Arcturus is an orange-colored star that immediately attracts one's attention because of its unusual color and brilliancy. It is the only star of first magnitude in the kite-shaped constellation of Bootes. You can find it readily by extending the line of bright stars that marks the handle of the Big Dipper toward the southeast, a distance about equal to the extent of the dipper itself. Bootes is known by the several names of The Hunter, The Driver and The Herdsman. As The Hunter he is represented as chasing the two bears, Ursa Major and Ursa Minor, around the pole with the aid of Asteron and Chara the two Hunting Dogs, which lie west of Bootes and below the handle of the Big Dipper. In the role of The Driver, Bootes is represented as driving The Oxen and the Wain, a common name in some lands for the seven stars of the Big Dipper.

With Spica, the white star of first magnitude in Virgo, and with Denebola, the star of second magnitude at the tip of tail of Leo, Arcturus forms a huge equilateral triangle. Virgo is the longest constellation of the zodiac, and Spica, its only first magnitude star, is supposed to represent the ear of wheat that The Maiden holds in her hand. In Virgo and the neighboring constellation of Coma Berenices is a most remarkable region where countless faint nebulae are thickly clustered. They lie far exterior to the Galaxy at distances of millions of light years from the earth. In no other part of the heavens are there so many of these faint, far away, nebulous objects, each one of which represents, it is believed, a great island universe of suns similar to that great star system known as the Galaxy, or Milky Way. In June that branch of the Milky Way that arches high across the winter sky has disappeared from view, while the branch that is so conspicuous in late summer and early fall lies along the eastern horizon. So, in this month, we miss the splendor of the Milky Way in the evening sky and not until July is this beautiful, luminous band of light once more conspicuously visible in the evening hours.

Scorpio is the most brilliant constellation visible in summer skies. Its head appears first above the southeastern horizon in the early evening in June, and soon the fiery red Antares, in the heart of The Scorpion, adds its splendor to that of the other first magnitude stars of summer skies. The tail of Scorpio is formed of a long curved line of bright stars not fully above the horizon in northern latitudes in the early evening until midsummer. Scorpio is the most brilliant of all the zodiacal constellations. In addition to its first magnitude star, Antares, it contains six stars of second magnitude and seven of third magnitude. Antares is a supergiant star four hundred million miles in diameter. Until the discovery of the huge companion of Epsilon Aurigae, which, placed at the center of the solar system, would extend beyond the orbit of Uranus, it was the largest known star. Antares is at a distance of about 160 light years from the earth. Vega and Arcturus are comparatively near neighbors of the solar system, at distances of about 26 and 38 light years, respectively. Spica is a giant star nearly 200 light years distant from the earth, about equal in intrinsic brightness to Antares, and with much greater light-giving power than either Vega or Arcturus, which appear to be much brighter than Spica because of their nearness to the solar system.

The only planet that will be conspicuous in the western evening sky in June and July is Venus, which, though far outshining in splendor all other stellar objects, is not seen at its best at this time. It is now moving slowly to the eastward of the sun and will set about two hours after it during these months. Mars is rapidly approaching the sun in the evening sky in Gemini and will be in conjunction with the sun on July 24 when it will pass to the morning sky. Jupiter is now in Aquarius and in June is well in view during the second half of the night. By the end of July it is visible the greater part of the night, rising shortly after sunset. Saturn is a fine object in the morning sky and is in quadrature on July 10 when it is due south at sunrise. Mercury is too close to the sun to be seen until the last week in July. It will be in greatest eastern elongation on July 31 when it will be about 12 degrees above the western horizon at sunset, and not very well placed for observation. On June 21 at 9:04 P.M. Eastern Standard Time the sun will be at its greatest distance north of the equator and summer begins in the northern hemisphere.

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If you have not already requested your copy of The American Nature Association *Quarterly Bulletin,* available to all members on request, just send us a note or post card with your name and address. This Bulletin is valuable to all interested in the vital problems of conservation confronting the United States today.

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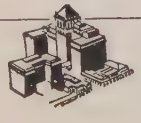

INDOORS AND OUT

(Continued from page 327)

lation that strikes one with a question after reading Thoreau, or considering the effects of man on the birds in our own recorded times. In Donald Culross Peattie's *A Prairie Grove* (Simon and Schuster, $2.50) one finds reference to "the last great flight of the passenger pigeons" in his grove and a telling expression of man's influence on wildlife in the statement: "But there was a time, when the big cats were gone and the deer grown plentiful, when sheep and fowl and calves were first here to be raided, that the timber wolves were king for a decade"—*for a decade,* a poignant limitation that recalls Mr. Halle's hesitation to draw conclusions "in terms of the whole."

This book of Mr. Peattie's has been described as the biography of an acre, as a naturalist's story of primeval America, a history of early exploration, and a story of a family. It is all these, but at the same time it is so much Peattie himself that it might well have been a long poem. So well has Peattie mastered the use of his style to create a delight of its own that the book has this pleasure added to the interest in its subject matter. In fact, in many places it is easy to catch a cadence that almost versifies the prose, as for instance when he writes: "I know that night. I know the fireflies' hour that comes when the dog-day cicadas cease the shrill shearing of their songs."

Though seldom so well told, the story that Peattie tells of wild creatures yielding their acres to man is one with many settings in America. It has a poignant place in *Tales and Trails of Martha's Vineyard* (Little, Brown and Company, $1.75), a reader's guidebook by Joseph C. Allen, a native of this island, which, incidentally, is just off Cape Cod, described by Thoreau. For this island was the place where "the last heath hen was carefully watched and studied by ornithologists for years before it disappeared," though fortunately, as this book and its excellent photographs show, the island is still a most pleasant place, and a charming place with a dash of quaintness from the days of whalers, and pirates, and smugglers.

A more conventional sort of guidebook is *New Hampshire: A Guide to the Granite State* (Houghton Mifflin Company, $2.50), written by workers of the Federal Writers' Project of the New Hampshire W.P.A. Yet there is nothing conventional in the richness of the book, which for one thing includes enough photographic illustrations to make a dozen books attractive—and photographs of a quality and depth that are amazingly excellent and uniform. There is an introductory essay on "The Merriest of the Puritans", by Cornelius Weygandt, and a comprehensive as well as rather detailed discussion of "New Hampshire's Natural Settings," including a short section devoted to wildlife—incidentally a term used to include trees and flowers, as well as birds and mammals. It includes annotated tours and maps and an index that makes the book a reference work as well as a handbook. It is a credit to New Hampshire, to the publishers, and to the Federal Writers' Project. But it makes it difficult to stay away from New Hampshire—this fresh reminder of Chocorua, the White Mountains, and the Ammonoosuc.

But even though one can not travel, or watch the summer on his own acres, there is

(Continued on page 377)

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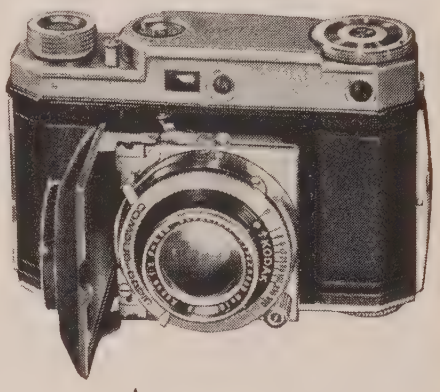

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER
Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Signs of Instinct or of Intelligence

At the end of a year's work in school, or anywhere else, it is well to look back to determine whether wisdom has ruled in all that has been done. From such analysis, new activities may be planned intelligently. With a background of experience, new ventures should be more profitable.

So far, this year, this page has suggested exploring fields dealing with how things move about; how they get their food and what they do with it; how they use sound in understanding their environment; what may be the general life story of many things. This does not exhaust the possibilities of worthwhile fields of study, but it does provide a basis on which we may build. It is not enough for the success of many living things that they merely run around, eat, hear and reproduce. They must do these and other things intelligently. And what applies to wild living things applies equally to human beings, however wild they may appear in some of the things they do.

It is neither possible nor desirable that this page give a complete survey of what underlies intelligent or instinctive behavior. Rather should we confine our suggestions to seeing how we and other living things behave in certain fields either through actual experiment or through records available in articles in this or other periodicals.

It is true that we can, in certain respects, sense what is going on about us as well as can what we call the lower animals. We cannot use our noses as well as some dogs. Neither, perhaps, can we see as well as some of the birds of prey. We probably lack the tactile sense of certain fish, insects or even amphibians. But, by and large, we probably measure up well with these other creatures when all of the senses are considered. A distinctly worthwhile school activity would be to compare the ability of the children to sense what is going on about them in competition with other living things.

June is a month of field meets and other athletic contests. Why shouldn't we have competitions calling for superior ability to use our eyes, ears, noses, mouths and other sensory organs as well as to use the muscles of our arms, legs and bodies? We have bird dog competitions in which one dog is matched with another in ability to sense the location of game. Why can't we evolve a field day in which we can decide how far away a bird on a nest shows evidence that it sees us, as contrasted with the distance at which a trout in a brook or a frog at the edge of a pond shows signs that it sees us? Make a list of the records of this sort and bring them together to determine their worth. Review the work suggested on this page in past issues, with particular attention to the location of the different sense organs of animals.

It cannot be assumed that ability to see, hear, smell, taste and feel is accompanied necessarily with what we call intelligence. What is more important to a living thing is what it does with what it senses. And the ability of things to do things is not always a sign of intelligence. A paralyzed spider, such as was shown on page 217, volume 31, of Nature Magazine, may be able to see an approaching enemy but it can do nothing about it. An ant-lion, or doodle-bug, such as was described on page 206 of the same volume, may be able to do one thing well, but that thing may not always be the wise thing to do.

To further this study of skills as contrasted with ability to sense things it might be well to look locally for examples of skilled masons, carpenters, miners, fliers, swimmers, fighters, jumpers, paper-makers, web builders, nest builders, shelter builders, and so on. It will be found that excellent masons may be found among the birds, the mammals, the insects, the fish and among other groups. Most of us could not match the skill shown by some of these lower animals, yet we can master them in most cases. Thumb through your files of Nature Magazine and make lists of examples of superior skill in the fields suggested above. It will be seen that common skills may be possessed by creatures belonging to widely separated groups. It is not always easy to distinguish, for example, between the sunning nest of a squirrel and a nest of a number of kinds of birds. To what extent can you allocate to a major group responsibility for any evidence of skill you pick out in Nature? Can you always say of something: "This was done by a bird", or: "This was done by an insect"?

Of course the possession of a skill is frequently accompanied by the possession of tools suitable to exercise that skill. A tail, a toe-nail, a beak, teeth and other instruments used in shaping the environment are necessary for the exercise of certain skills. With them, the work may not be done. Without them, it could not be done. Spend some time, then, while making these studies, looking for the devices that give a particular skill to any particular animal. Are there powerful muscles present to make the tool do what it may be called upon to do? Are the muscles able to respond quickly to meet an emergency? Is there evidence that muscular control is definitely tied up with some sensory ability to the end that it may be used to advantage? All of these are questions that might be asked while developing an understanding of skill possessed by children of Nature. Again look through your files of Nature Magazine for study material to widen your experiences beyond what can be found in your own backyard. The rotogravure sections, with their splendid pictures of close-ups of small things, may lead you to see in your backyard neighbors some things you would not normally notice. If they induce you to look more closely they will have served their purpose.

But ability to sense and to do things is not necessarily a sign of what we may call intelligence. Unless the experiences gained from sensing and doing things can be used to advantage in new situations, intelligent use is not made of them. Bobby, the gorilla, discussed in this number of Nature Magazine, undoubtedly could sense some things not significant to his master. That he has more powerful muscles than human beings goes without saying. He may be able to sense things and to do things, but he cannot match wits with the human species or the two might have been on opposite sides of the bars of his cage. Were it not for the intelligence of his masters, Bobby himself would probably not have been able to live in captivity as long as he did. He never could have grasped the meaning of Vitamin D.

A few articles that have appeared in recent Nature Magazines may deflate our ego and, therefore, may be worthy of suggestion. Read the story of Wisconsin game in volume 31, page 238; of waterfowl, on page 115; of deer, on page 106; of Indians and game on page 20 and of farmer-sportsmen relationships in the current issue of this year. Witness what our thoughtlessness has done in controlling erosion in this country on pages 17, 83, 143, 166; in controlling vermin, pages 159, 171 and 50. Then, for fear that you may be too disgusted with what humans have done, read the story of the work of scientists who have studied and helped wildlife as outlined in the May number, and the work of correlating wildlife conservation with the activities of the NYA. The reading of these articles by school children may stimulate them to make decisions as to what they may want to do in the solution of wildlife problems, and these problems must be solved not only by us but those who are now school children. If we do not recognize this, it may be taken as a sign of lack of intelligence on the part of our generation.

Many intelligent acts call for ability to understand the present, evaluate it in terms of the remembered past, and predict the future. We may look at a lake and find it well populated with ducks. We may feel that that is evidence that there are now enough ducks and that there is no danger of their disappearing from the lake. We may not, then, be concerned about the future.

If, however, we remember or have records of how much more abundant the ducks may have been on the lake in the past, and we can see that the change between the past and the present has been brought about by practices that we can control, we show lack of intelligence if we do nothing to assure improvement in the future. This of course implies an attitude that desires that the future be brighter than the present, rather than a policy of enjoying the present to the fullest and letting the future take care of itself. Bobby, the gorilla, could not project himself adequately into the future, or at least one of his immediate ancestors could not have done so. As a result, he as an individual, or as a child of an unwise preceding generation, spent his life deprived of the wealth his home environment could have given him. When we look at what some of our human species are doing, are we so sure that in all respects we should be proud of the differences between us and Bobby? We have the ability to determine our future to a considerable extent. Are we using that ability to the maximum for the improvement of things in general?

Further elaboration of school experiences along this line may be found on page 14 of Nature Magazine's *Guide to Science Teaching*, copies of which are available from the American Nature Association, 1214 Sixteenth Street, Washington, D. C., at twenty-five cents a copy.

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INDOORS AND OUT

(Continued from page 375)

still the possibility of a garden, and *The Gardener's Day Book* (J. B. Lippincott Company, $2.50) by Richardson Wright, the editor of "House and Garden", makes this possibility very charming Even indoors one can reap some of the benefits of gardening if he has this book at hand with its discourses for the months as they come. There is an item for each day, including a dozen "Tales of Our Valley" and another series entitled "Remembered Gardens". And for every month save December there is a "Long Piece". As the publishers say, this is "a scintillating collection of short stories, strange anecdotes, gay discourses and humorous advice." For July 1 one reads that "the fruits of gardening are three in number: it makes for a longer life, it develops an even temper and it produces chapped hands." And, recalling Thoreau once again, there is for July 25 the notes on a Cape Cod gardener who "called the formal garden the former garden, said that the *Rosa rugosa* hedge was Rosabugosa (all in one breath) and *Euonymus* he called ornaments."

VISITS WITH WESTERN ALPINE FLOWERS

(Continued from page 372)

By far the most outstanding plant to me was the yellow alpine saxifrage, *Saxifraga chrysantha.* Scarcely more than two inches in height, it was in places nearly buried by the hail. The large yellow flowers with their reddish centers formed small but numerous patches of color amongst the rocks. The Pike's Peak "forget-me-not," *Mertensia alpina,* was plentiful and added its touch of blue to the slopes. We found a lovely pink form of this alpine bluebell.

A plant that impressed me was the alpine spring beauty, *Claytonia megarrhiza,* a relative of our eastern woodlander. It seemed to prefer the more rocky places, many times wedging itself into the narrowest of cracks. The broad, succulent leaves lie flat on the ground or rock; they are surrounded by a "wreath" of waxy white flowers with pink backs. Another plant found amidst the blocks of disintegrating bedrock was the alpine sorrel, *Oxyria digyna,* a member of the buckwheat family. It was of more interest than beauty with its eight-inch stems bearing many small greenish flowers, tinged red.

In spots the alpine members of the paintbrushes, a colorful group, grew in quantity. *Castilleja occidentalis,* with yellow to cream-hued flower bracts, was the most abundant. These showy plants are thought by many to be parasitic on grass or other plant roots.

And finally, but by no means of less importance, there were the primroses. The fairy primrose, *Primula angustifolia,* is a typical high-alpine some three inches tall. The rosy-pink flowers appear singly above dark green leaves. In contrast with this was the queen of the alpine brooks, *P. parryi,* more commonly called Parry's primrose. The heads of large, rosy-purple blossoms are borne on foot-high stems above rather light green leaves. This plant, a robust grower, frequents moist, not-too-exposed places above and somewhat below treeline. Often, before one sees this primrose, he can detect it by its strong fragrance.

It was with sincere regret that we left the Rockies behind and headed for the Cascades in the Pacific Northwest.

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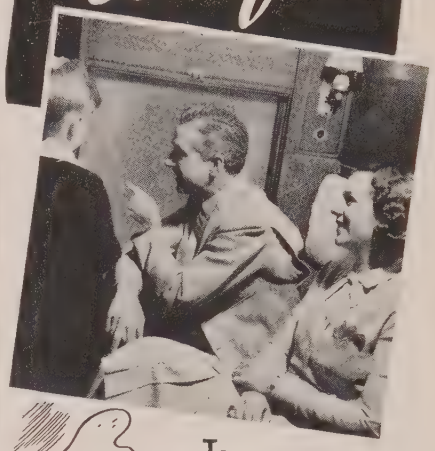

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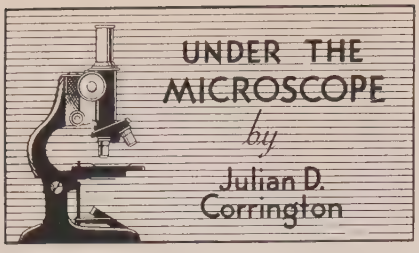


Hydra

Among the best known and most interesting denizens of the microscopic world is hydra, the freshwater polyp. These technical names are now familiar to many because this tiny creature has been so widely used in elementary biology classes.

The three commonest American species are the green hydra, *H. viridis* or *viridissima,* small and bright green in color; the brown hydra, *H.* or *Pelmatohydra oligactis* or *fusca* or *diœcia,* larger and usually brown, with a somewhat constricted basal stalk; and the gray hydra, *H. vulgaris* or *grisea,* also large, but without the basal stalk, and either gray, brown or orange. This multiplicity of scientific names shows how uncertain were early naturalists of the number of distinct species or their relationships.

One looks for hydras in standing water, from pools to large ponds, especially in those that are clear and sunlit. Examine the stems of aquatic plants, the under sides of lily leaves, and sticks, stones, dead leaves and other trash on the bottom. At first a hand lens may be necessary until one becomes accustomed to spotting these minute organisms; carry a glass dish—the crystallizing dish of the chemist is best—and place in this a quantity of the material to be examined, together with an inch or so of water. Go over each object carefully and look for a slender thread averaging half-an-inch in length, with a crown of tentacles around the upper or unattached end.

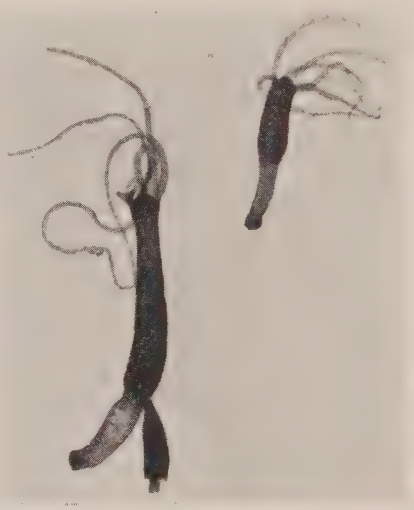
These animals have such great powers of contractility that no exact sizes may be stated; a fully contracted individual may be a mere knob, one-eighth inch high, with tiny nubbins for tentacles. A minute later, if undisturbed, the same hydra may stretch out to over an inch in length, with a circlet of long and slender tentacles.

A WHOLE MOUNT OF HYDRA AS SEEN THROUGH THE MICROSCOPE

Hydra is a sessile animal—that is, attached to some object of the substratum—but not permanently so as with sponges and corals. The foot or basal disc adheres, but can be detached and shifted. Four different types of locomotion have been described—a gliding along on the foot, walking on the tentacles with the basal disc elevated, somersaulting end-over-end, and the inch-worm method.

Hydras are voracious animals. They will try to devour anything that comes within their range, and sometimes tackle prey too big to engulf, turning themselves partly inside out in the process. Water fleas such as daphnia and cyclops, small worms, insect larvæ and other tiny aquatic creatures fall victims to hydra's most ingenious system of attack, one which is successful in killing and encompassing objects much larger than the diameter of the hydra's own body.

All over the tentacles, and to a less extent on the body, are large numbers of nettling organs or *nematocysts,* appearing under magnification as oval, glistening swellings. Each such structure is contained within a single cell and consists of a hollow bladder within which is a coiled and inverted tube of highly microscopic dimensions. A trigger protrudes

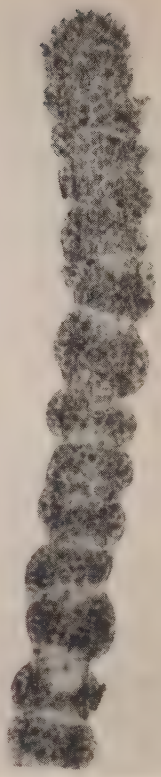


HYDRA BUDDING, WITH ONE BUD JUST BROKEN OFF AND NOW AN INDEPENDENT ANIMAL

to the exterior. When touched, this trigger sets off the apparatus, shooting out the tube with explosive violence, piercing the enemy or prey, and introducing a minute drop of poison that quickly numbs or kills small creatures. Bathers in the ocean are familiar with nematocysts if they have ever run afoul of some of the larger jellyfishes, marine relatives of hydra.

Alas for the unwary daphnia that blunders unwittingly against a tentacle of the plant-like and seemingly inoffensive thread we call a hydra! The somnolent monster comes to life with amazing energy, reaching over with other tentacles to assist the one first touched. Hundreds of nematocysts may be discharged and the paralyzed daphnia is quickly seized and transferred to a spot in the center of the crown of tentacles, where a hitherto invisible mouth now opens to receive him!

Anatomically, hydra is reduced to the simplest of terms for a many-celled animal—



TIP OF TENTACLE OF HYDRA, THE SWELLINGS BEING BATTERIES OF NETTLING CELLS

two layers of cells surrounding a central cavity, which has only the single mouth opening. This body wall is capable of great expansion and will stretch mightily to admit the captured daphnia, the mouth closing over the victim and a bulge in the upper half of the body now marking the final resting place of the hapless crustacean. The interior layer of cells soon digests the prey and passes some of the products of the meal along to those cells making up the outside layer. New nematocysts are grown. The hydra may move to a more favorable spot or, at certain seasons, crawl up a submerged plant to the surface of the water, pierce the surface film with its basal disc and then float away, tentacles hanging downward, suspended from the "ceiling" of the pond by the power of surface tension.

In this manner hydras may drift downstream at pond outlets and many are eaten by fish. The same system may be observed when hydras are kept in an aquarium.

Aside from the business of feeding, hydra must also attend to reproduction and is remarkably well equipped for this important duty, having no less than three methods for its accomplishment. Two of these are common to certain other of the lower animals and are performed without the presence of sex, being termed nonsexual or asexual, while in the third case the usual sex elements are concerned.

Hydra may split in two, either across or lengthwise, an uncommon asexual method of reproduction termed *fission.* Also asexual is the plant-like phenomenon of *budding,* a small knob appearing near the base of the parent, expanding, growing, acquiring tentacles, and finally when nearly as large as the parent, breaking off and leading an independent existence. From one to several buds in various stages may be present at one time, with or without sex organs.

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By the *sexual* method of reproduction, hydra develops spermaries and ovaries and produces a fertilized egg that grows into an embryo. This is discharged from the parent after receiving a spiny protective covering, and falls to the bottom of the pond to pass the winter in a quiescent state, resuming growth into an adult hydra in the spring. In *Hydra oligactis* the sexes are in separate individuals, while the other two species are hermaphroditic, with both sexes present on the same animal, although usually not at the same time, a device to prevent self-fertilization.

Beginner's Primer

How does one go about studying such forms as hydra under the microscope? When you can see methods demonstrated in the schoolroom it is easy to learn and apply them; but reading printed instructions is a different matter and friend author must be very explicit. So a word about equipment will not be amiss.

The particular item of glassware used is called a Syracuse watch glass; round, flat-bottomed, with low sides and fitting on the stage of a microscope; accommodates all sorts of fluid cultures. They are obtainable from any apparatus supply house and most of the biological houses, lists of which appeared in our January and February issues; they are usually priced at fifteen cents each.

Petri dishes and biological fingerbowls are also frequently used. Depression slides make excellent miniature aquaria for study under a microscope. These are thick slides of regulation size with a concavity ground into the center of one surface, and may be capped with a circular cover glass and sealed with vaseline, to prevent evaporation.

A specimen of hydra is transferred from the collecting bottle to one of these pieces of glassware with a pipette (medicine dropper). The animal must be drawn up quickly, then squirted out again very rapidly, before it has time to adhere to the inside of the pipette. Add enough water to cover the specimen so that it is free to move about. Always use the pond water from which the hydra was taken; keep an extra supply on hand for this purpose. See that all glassware used, including the pipette, is scrupulously clean, as residues of chemicals might kill the creature.

The microscope stage must be flat when examining specimens in fluid. If your instrument is a New Gem or other model having a permanently tilted stage, place a rubber eraser under the rear of the foot. Examine hydra with the lowest power of which your microscope is capable. If you operate one of standard size you will find in nearly every case that the front combination of the low-power objective can be unscrewed and laid aside. The focal point of the remaining lens combination is now found much higher up and the magnification greatly reduced.

Study chiefly the activities of hydra. Later the detailed structure of parts, especially the nematocysts, may be observed by mounting an individual on an ordinary slide in a drop of water and adding a cover glass, which more or less crushes the animal but makes high power available. Prepared stained slides may be purchased cheaply and consist of whole mounts of normal individuals, whole mounts with buds, with spermaries, with ovaries, with ingested food, special demonstrations of the nerve net, and both cross and

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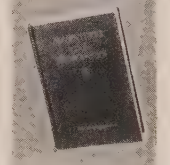

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longitudinal sections.

To observe feeding habits, transfer a daphnia or other small aquatic form with a pipette, allowing the food to come in contact with one or more tentacles of hydra. Tiny fragments of meat, raw or cooked, and beef juice may also be proffered, usually with success.

Advanced Hints

In order to prepare a satisfactory whole mount slide of hydra, the specimen must be dispatched by a method so rapid that the animal is unable to contract; otherwise one obtains a mere nubbin that shows no structure. For this purpose the favorite method is to place a hydra in a watch glass with just enough water to permit it to expand, and when fully extended squirt over it, from base toward tentacles, a pipette full of hot Bouin's fluid or corrosive acetic. This sudden deluge should carry the tentacles out straight and fix the animal instantly before it has a chance to contract.

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Now fill the watch glass with the hot fluid and allow to stand for ten minutes. Pipette or pour off the fixer and replace with 70% alcohol, changed several times over a period of ten or fifteen minutes, to wash out the fixer. If corrosive acetic is employed, add some iodine to the alcohol to give it a port wine color, and after ten minutes transfer to clear 70% alcohol. The iodine removes mercury crystals that would otherwise form.

Stain with dilute hæmatoxylin, alum cochineal or borax carmine for two to four hours, as convenient. This means to pipette off the alcohol used for washing and replace with the stain in the same watch glass. Examine with a hand lens. The hydra will probably be considerably overstained and should now be destained to the correct density of color by first pouring off the stain, rinsing in tap water, then placing in 35% alcohol to which has been added enough hydrochloric acid to make the whole a one-half percent solution: i.e., 200 parts alcohol to 1 of acid.

Action of the destain is rapid and the specimen must be watched. When sufficiently bleached, stop the destaining by pouring off and replacing with tap water—several changes, over a period of five minutes. Now dehydrate the specimen through a graded series of alcohols, clear in xylol and mount in balsam. Use some small bits of broken cover glass scraps as props for the cover in mounting so that the specimen will not be crushed.

Bouin's Fluid, standard fixer for animal tissues:

Picric acid, saturated aqueous solution	75 parts
Formalin, full strength commercial	25 parts
Glacial acetic acid	5 parts

To prepare a saturated aqueous solution of a solid, shake up in a bottle of water until no more will go into solution, the excess accumulating as a sediment at the bottom. Use this stock solution in making up formulas, pouring off as needed without disturbing the sediment.

Corrosive Acetic, standard fixer for invertebrates:

Corrosive sublimate, saturated aqueous solution	95 parts
Glacial acetic acid	5 parts

Corrosive sublimate is also termed bichloride of mercury and mercuric chloride. It is very poisonous; care must be taken to keep it away from mouth, eyes and skin. It must be handled with a glass or horn spoon, as it corrodes metal.

Hæmatoxylin, group name of standard stain:

For general purposes Delafield's formula is preferred and should be purchased ready for use as its manufacture is too difficult outside the professional laboratory. Dilute one-half with distilled water for use. The most widely employed of all stains.

Alum Cochineal, general stain:

Potassium alum	1 gram
Powdered cochineal	5 grams
Distilled water	100 cc

Mix the ingredients and boil until no more than two-thirds of the original volume remains. Filter; add a few drops of carbolic acid or a pinch of thymol crystals to prevent mold.

Formulas

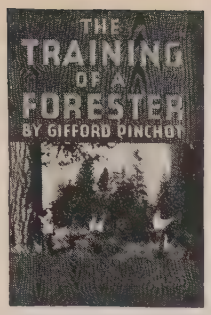
Recommended procedures: 1. If you do not save your copies of NATURE MAGAZINE intact, cut out all formulas given in these columns, paste on 3 x 5 index cards and file alphabetically for future reference. 2. If you do not wish to cut out any parts of the magazine, make a card index notation of the volume, issue and page number of all formulas and file the cards alphabetically so that you can quickly find any given formula. When first mentioned in these columns, the full formula will be given, but will not be repeated. This means that if a reagent or solution of any sort whose manufacture requires a formula is merely mentioned by name, the formula has appeared in a previous issue.

Club News

How many microscope clubs and societies are there, scattered over these broad United States and our neighbor to the north? No one

The Training of a Forester

By Gifford Pinchot



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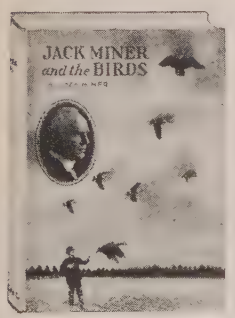

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knows; figures are not available, and this department will be very much interested in locating as many as possible. Later on we are going to give some points of advice in the matter of how to organize a microscope club. Meanwhile, affiliate with your local organization, if there is one, and write in to the editor of this department if you represent a group already functioning. We want information similar to that given below about every club in existence.

* * *

Microbe Hunters Club is the title of an active and keenly interested group of young people of the Roosevelt Junior High School, Westfield, New Jersey. Now in its second year, this club purposely limits membership since a small organization of really sincere members is much more effective than a large, loosely-knit club. Each of the thirteen members owns a microscope, most of them of good quality. They meet every Wednesday and make slides, go on a collecting trip, study simple and near-at-hand materials, read papers and conduct prize contests.

One member specializes on photomicrography, another has rigged up a microprojector, still others make cabinets and slide boxes in the school woodshop. They are collecting slides and books on microscopy. This year the President is Arnold Whitaker; Vice-President, William Carlin; Secretary, Barbara Wolfs; Treasurer, Virginia Eacono, and Sponsor, Miss Laura Owens. An accompanying photograph that the club kindly sent us shows some of the young microbe hunters at work.

TRADE NOTES

Every microfan should take advantage of our catalog offering for this month—Bausch & Lomb's *Magnifiers and Readers,* a twenty-eight page illustrated booklet describing all forms of simple microscopes. No matter what type of compound instrument you own, or the purposes for which you use it, there are times and circumstances that demand a hand lens, pocket magnifier, dissecting microscope or other form of low-power magnifying instrument pictured in this handsome booklet. A copy is yours if you will send a three-cent stamp to this department of NATURE MAGAZINE.

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* * *

Under the Microscope is a department of NATURE MAGAZINE designed for those readers interested in microscopy and maintains a service to render assistance with problems in this field. You are invited to take advantage of this service. Address all inquiries to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C.

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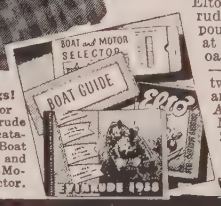

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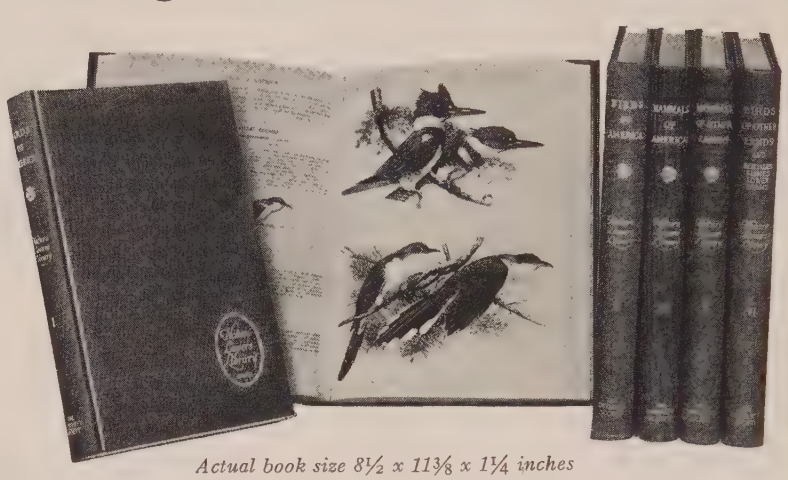

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DON'T think, or continue to think, that a puppy can be trained to behavior as you wish it (especially in an apartment) or "housebroken" without the exercise of infinite patience, time and tact.

DON'T, if you acquire an older dog and one trained to the house, forget that YOU have to win his affection and understanding, and that he has had a previous owner to whom he has probably given his allegiance.

DON'T get your dog in a hurry. Consider what you wish your dog to do and to be. Consider your own temperament and your living conditions. Bear in mind that while a dog is a dog, always, there is a vast difference between a St. Bernard and a Pekinese—as much difference in temperament as in size. A huge dog in a town apartment is as much out of place as a Pekinese would be on a sheep farm or on a cattle ranch.

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DON'T relegate to your servants the exercising of your dog. If you have neither the time nor the inclination to walk him, don't keep a dog! Very few servants care to be valets or nurses to their employers' dogs any more than the dogs enjoy being angrily hurried around the block. Don't cultivate the idea that your dog is not as sensitive and as sensible, in his own way, as you are, or like to think you are.

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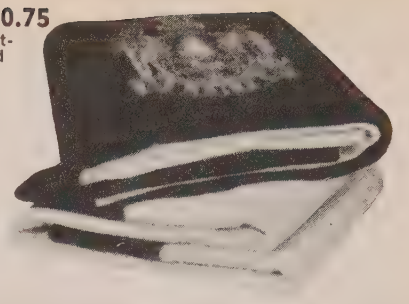

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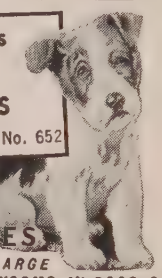

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We are glad to pass on an offer by the Pan American Society of Tropical Research, P. O. Box 1698, New Orleans, La., to send to anyone sending a stamped, self-addressed envelope seeds of Yerba de la Pulga. It appears that this tropical plant exudes minute quantities of a drug that is fatal to insects but harmless to birds, humans, or other mammals. The Society believes that it will, if widely planted, aid in checking insect depredations. Instructions for planting will be sent with the seeds, all without obligation and in the interest of research.

DOG DON'TS

(Continued from page 383)

maturity, he should have one substantial meal—and only one—a day; and that meal should be a properly arranged and balanced ration, suited to him. For the rest of the day, give him ample water and a bone to work upon or play with. To feed your dog any old way, at any old time, on any old scraps left over from your own probably ill-considered diet, is a sure way to bring sickness to him, trouble to you. To permit or encourage your dog to beg at the table and to give him scraps is an act of mistaken generosity. Actually you may lessen the short span of his life—a span which, if you love your dog, is never long enough.

DON'T neglect your dog or ignore or be careless of his desire to be a companion. No dog is a "nuisance", no matter how busy or engrossed you may be, IF you are on the right terms with him. It's wrong to "shoo" him away if he invites your attention. He wants something vital to him at the moment. Give it to him. A pat on the head does much; an angry word or an impatient scowl undoes everything.

(Continued next month)

TOWNSEND'S SOLITAIRE

(Continued from page 343)

man. Recently a stone building was under construction near Manzanita Lake in the Lassen National Park. In a crevice between the stones of the wall, perhaps eight feet from the ground, a solitaire built her nest. Although workmen were moving about her all day, she incubated her eggs without disturbance.

We decided to photograph her while she was on the nest, if possible. Although she never took her eyes off of us while we were focusing the camera and taking the pictures, she bravely remained on the nest. We watched her come and go from her nest during the few days we stayed in the Park, but we had to leave before the eggs hatched. We were sorry not to see a new family of solitaires take their place in the kingdom of birds.

Science on the March

A new program on science topics began on June 1, over the Blue Network of the National Broadcasting Company. The series is being done by Dr. Carroll Lane Fenton, whose ability to present the story of geology in terms that fascinate the laymen has been proved in published books as well as in articles in Nature Magazine and elsewhere. These broadcasts, known as Science on the March, will be given at 6:45 p.m., Eastern Standard Time, on Wednesdays. Tune in.

Home Planting

Containing advice on the development of one's home grounds, *Planning and Planting Your Own Place,* by Louis Van deBoe, is designed to be of help to the amateur. It should also find favor with professional landscape architects because of the comprehensive lists of planting material included. The contents are particularly applicable to the region north of the Mason-Dixon Line and west to the Rockies. It is published by Macmillan and sells for $4.50.

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Photographic Notes

BY SAMUEL BROWN

THE CLOUDS IN THIS PICTURE FILL IN WHAT WOULD OTHERWISE HAVE BEEN A BLANK, UNINTERESTING SKY. SUPERSENSITIVE PAN. FILM, 1/50 SECOND, F.8

Clouds

One of the most beautiful fields for photography during the summer months is to be found in clouds. They are unusually attractive during this period of the year, and are a definite aid to composition, besides being pictorial in themselves. There are few landscapes that can be made attractive without clouds, and often these *make* the picture.

Although the eye sees a definite contrast between white clouds and a blue sky, the film is almost equally as sensitive to white as it is to blue. It is for this reason that most cloud pictures are disappointing. Some of the more color-sensitive films, such as Panchromatic, will register clouds if the proper exposure is given. In most cases, however, although clouds are the objects sought, a little detail in the foreground is required. In such cases, a color-sensitive film should be used with a light filter.

The amateur has available for his use two types of films falling in the general classes of Orthochromatic and Panchromatic. If the first of these is used, a light yellow filter is recommended. This will eliminate much of the blue coming from the sky, and will permit the white clouds to register fully. If more contrast is preferred, a dark yellow filter will give considerably more contrast.

Panchromatic film is by far, however, the most desirable emulsion to use when photographing clouds. This will ordinarily give sufficient contrast, with the use of even a light yellow filter, thereby permitting the foreground to register without increasing the exposure too much.

When making pictures in which clouds appear, the exposure must be very accurate, because only a balanced exposure will give detail in both foreground and clouds.

When using filters, it must be borne in mind that the darker the filter the less detail there will be in the foreground, and the more contrast in the sky. Where a particularly blue sky is photographed, a light filter should be used. Because films are so sensitive to blue, the use of a filter does away with much of the actinic rays of light, and the exposure must therefore be increased.

All filters have what is known as a factor, which is the number of times the proper exposure *without* a filter must be multiplied to give accurate exposure *with* the filter. In most cases, the two to four times filter will be found suitable.

When making pictures of clouds, a lens hood is recommended in order to eliminate rays of light coming from the side and which will fog the film. Pointing the camera to the sun should be avoided whenever possible, except when the sun is behind the clouds.

Unusual and unique effects can be obtained with the sun behind the clouds because this generally gives a golden rim around them, resulting in a pretty picture. Occasionally, also, rays of sunlight will filter between the rifts of the clouds, casting shafts of light to the earth. When such a condition exists, a dark filter is desirable in order to darken the sky sufficiently so that the sunbeams will stand out in contrast.

THE TREES IN THIS PICTURE FRAME THE MAIN SUBJECT BUT ARE SUBORDINATE TO IT. PANATOMIC FILM, 1/25 SECOND, F.16

Trees

Photographs of trees make attractive pictures, and, in addition, offer an excellent reference to the botanist who specializes in this subject. They also add a pictorial note to a landscape when properly placed in the picture area. When used for scientific purposes, pictures of trees should show all the delicate details of the leaves, branches and bark, so that they may be identified easily by their special characteristics.

One of the most useful cameras to be used in photographing trees is a Reflex camera, which is easily operated and permits the subject to be seen on the ground glass, right side up. A camera having a large stop, about F 4.5, is most desirable since this will permit pictures to be taken not only in bright sunlight, but in the dim light of the woods.

Panchromatic film is the best type to use when photographing trees, since they are sensitive to the green and brown that predominate in these subjects. When the light permits, a small stop should be used to show the details of the bark, growth of the branches and other features.

For best results, the bright summer sun should be avoided, as this will give sharp contrast and shadows lacking in detail. Where the subject is located in a group of trees, a checker-board effect will result from the sunlight filtering between the leaves of the neighboring trees. The most desirable light occurs during the early morning or late afternoon, when the light is soft, and detail is noticeable in the shadows.

When possible, these pictures should be made on days when there is little or no wind. Whenever possible, full exposure should be given, so that the shadows and highlights both will be full of detail. Summertime landscapes will be much improved when clouds and trees appear in the pictures.

* * *

Printing

(*Continued from last issue*)

After the dark room has been made ready for printing, and trays have been prepared

with solution, and printer and lights are in position, the following is the proper procedure.

Place the negative on the glass of the printing frame, or printer, with the shiny side down, leaving the emulsion side face up. The paper is then placed on top of the negative with the emulsion side down. Always remember this rule of emulsion to emulsion. Note that the emulsion side of the film is dull, while that of the paper is smooth and shiny. The emulsion side of the paper may also be identified by the fact that most paper curls slightly toward the emulsion side. The back of the printing frame is then clamped on, assuring perfect contact.

All paper is carefully covered so that no light will reach it, and the light is turned on to make the exposure. In the case of the printer, after the negative and paper have been properly placed, the cover is brought down and the light turned on, either automatically or with the switch. Generally, a soft paper will require only half as much exposure as the medium paper with the same negative, while the hard paper will require twice as much as the medium paper with the same negative. Thus it is seen that soft paper is about four times as fast as hard paper.

It is suggested that before making the first print, a sheet of printing paper be cut into strips about one inch wide. One of these should be exposed across the most interesting part of the negative, developed fully and rinsed and placed in the fixing bath. The light is then turned on to see whether this is properly exposed. If it is, then the print may be made, giving this exposure. It is then easy to determine the proper exposure by comparing other negatives with the one that you have tested.

With a little experiment and experience, it is possible quickly to determine exposures with a minimum amount of waste. After the print has been exposed, it is removed from the printer or frame and quickly and evenly immersed in the developing solution, face up. It is absolutely essential that the paper be quickly and evenly covered, so that it develops without streaks. In a few seconds, the image will begin to appear, and if the exposure has been correct, it will be fully developed in about 45 seconds. If the print takes longer to develop, it is under-exposed, while over-exposed prints will come up very quickly. In either case, these should be destroyed because they will never make good prints. Good blue-black tones are found only in accurately-exposed and properly-developed pictures.

After 45 seconds have elapsed, the print is removed from the developer and placed into the rinse bath where most of the developing solution is removed by the water. From here, it goes into the fixing bath. The print should be kept moving in the fixing bath for several seconds to assure even fixing and prevent stains. When there are several prints in the fixing bath, they should be carefully separated for a few minutes in order to allow the solution to reach every part of the print. If an acid short stop is used between developing and fixing, two or three prints may be placed into the short stop bath and then removed to the fixing solution.

After the prints have been in the fixer for several minutes, the white light may be turned on so that they can be inspected. Before doing so, be sure that all sensitized material is carefully covered.

Prints should be left in the fixing bath for at least 15 minutes, and then placed into a tray of clean water. All traces of hypo must be removed to assure permanence. This is accomplished by washing in a stream of running water for at least one hour. After the evening's work, the large tray in which the fixing was done may be used for this purpose. The tray is placed in the sink and raised at one end so that the water runs in at this end and out at the other.

Another method is to place a tumbler in the center of the tray in which the water is running. The overflow will then wash the prints efficiently. If running water is not available, they may be washed in 10 to 12 changes of water, allowing 5 minutes for each change. This is best done by using two trays, transferring the prints one at a time from one tray to the other, and refilling with fresh water.

Prints cannot be well washed if they are placed in a heap in the tray with water running in at one end and out the other. Prints must be kept separated at all times to allow fresh water to reach both sides and remove all the hypo. The prints should not be washed longer than is necessary, or they will become too soft and difficulty will be experienced when ferrotyping. After the prints have been washed, they are ready for drying. The simplest way is to remove all surplus water with blotters and then lay the prints face down on a piece of clean cheesecloth or on a towel and then permit to dry.

(Continued next issue)

* * *

Trade Hints and New Books

A new technique, known as *Synchro Sunlight Photography,* has recently been introduced. Simply, it requires the use of a synchronized speed flash in outdoor exposures. A little leaflet has been prepared by the Kalart Company describing *Synchro Sunlight Photography.* This is illustrated with many excellent examples of this type of work. Whether you use a synchronizer or not, the leaflet will be of interest to every amateur. Available from this department; please enclose 3c stamp for postage.

* * *

Owners of 35 mm. cameras will be pleased to learn of the new *Automatic Argus Speed Printer.* This new darkroom accessory provides a simple device for making small-size enlargements from 35 mm. negatives with the simplicity of contact printing. If you use a miniature camera, you will want additional information on the *Automatic Argus Speed Printer* available from the manufacturers, International Research Corp., Ann Arbor, Mich. Please mention NATURE MAGAZINE.

* * *

The Weston Electrical Instrument Corp., Newark, N. J., manufacturers of the well-known Universal Exposure Meter, now announce a new and less expensive model. The new instrument has many features, among which are extreme sensitivity and compactness. Full descriptive material is available from the manufacturers.

* * *

Agfa Ansco Corp., Binghamton, N. Y., have two important announcements this month. The first concerns "Supreme Film" for 35 mm. cameras. This is a new high-speed panchromatic film that retains all of

(Continued on page 389)

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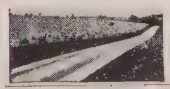

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PHOTOGRAPHIC NOTES

(Continued from page 387)

the features of the most desirable fine grain film available. The second announcement is concerning Agfa "Super Pan Press Film", which is now available in all amateur size roll film. This is a new sensational high-speed panchromatic film that makes snap-shooting possible under the most adverse lighting conditions.

* * *

Owners of Leica Cameras will be interested in the newly-introduced "Leica-Motor". This accessory takes the place of the bottom base plate, and, when attached to the camera, the whole forms a compact unit. The "Leica-Motor" is wound by means of a key and enables up to 12 exposures to be made in quick succession. Further information is available from E. Leitz, Inc., 730 Fifth Avenue, New York, N. Y.

* * *

A Titler for the 8 mm. Filmo has just been announced by the Bell & Howell Co., 1801 Larchmont Avenue, Chicago, Ill. Constructed from aluminum, the camera is fastened securely by an arm that bears two mazda lamps. At the upper end of the stand is a highly-corrected copying lens in the Filmo snap-on-mount to which the camera is fastened after the regular lens has been removed. The titler is accurately pre-focused on the title card holder on the base. The titler may be used vertically or horizontally as convenient. This new Filmo accessory enables the use of Kodachrome or black and white film in the making of motion pictures of small objects such as insects, flowers and butterflies. Further information may be obtained from the manufacturers. Please mention NATURE MAGAZINE.

* * *

The *McKay Photographic Test Chart* designed by Herbert C. McKay, F.R.P.S., published by Knight Publishers, New York, N. Y.

This new chart is an ingenious device that will enable the photographer to test quickly and accurately all of his equipment in connection with his photographic work. In addition, it may be used for testing, developing times, filters, resolving power, exposure meters and many other processes. This test chart fills a long felt need for a device that will enable the amateur to test his equipment without the expense and bother of having it done. It will also enable him to judge for himself the proper procedure in all of his photographic work. If you are interested in the hows and whys of your photographic equipment, you will certainly want one of the *McKay Photographic Test Charts,* price $2.50

* * *

Color Photography in Practice by D. A. Spencer, published by Pitman Publishing Co., New York, N. Y. Price $6.00.

A good authoritative text has long been needed on the subject of color photography. Mr. Spencer, who is the past president of the Royal Photographic Society, is perhaps the one best equipped to write this book, and he has made this important contribution to photographic literature. The theorist will be delighted with the many technical explanations of the various processes, while the practical photographer will find much that he can use to his assistance in the many practical processes, such as Kodochrome and Dufaycolor. Illustrated with nine color plates, showing excellent examples of color photography and illustrating the various principles of this work, the book is as beautiful as it is practical.

* * *

The photographic department of NATURE MAGAZINE is edited for its readers interested in photography and maintains a service that renders assistance with any photographic problem. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C.

Cordially,
SAMUEL BROWN.

AMONG OUR AUTHORS

Julius Moritzen (Meet the Danish Stork) is a native of Denmark, although long a resident of the United States. He has written widely on Scandinavia, and is the author of *Georg Brandes in Life and Letters.*

Fred Schunk (Jelly-fish of Inland Waters) is a young naturalist who works among the northern Alleghenies, not far from the headwaters of the Lehigh River and the quaking bogs of the Pocono plateau.

Marguerite Yancey (The Quest for Galax-Leaved Shortia) writes that she is "a newspaperwoman whose frozen assets include degrees from the University of Tennessee and the University of California. For five years she pounded obscure typewriters in eastern ports like Shanghai, Manila and Hongkong; helped cover a Sino-Japanese war; saw the beginning of the end of American domination in the Philippines. Sole claim to fame: only living 'lady journalist' who has circled the globe without writing a book."

George F. Dillmann (Nature Study—Why and How?) is, as may be gathered from his article, teacher of Nature Study at Manumit School in Pawling, New York.

Austin C. Lescarboura (Taming the Mushroom) was formerly editor of *Scientific American* and managing editor of *Popular Science Monthly.* He and his staff are now specializing in free lance writing with particular emphasis on the popular science field.

Old Oak Dies

Reputed to be one of the oldest oak trees in the United States, and credited with the prime old age of 650 years, the great white oak at Williamson, West Virginia, this year failed to put out leaves. Several months ago the State Forester, D. B. Griffin, noted a fungus on the tree, a sign of a dead or dying forest monarch. Now fears appear to be justified in fact. Known as the Mingo Oak, for the county in which it is located, the tree is 146 feet tall with a girth at the ground of thirty feet.

Manhattan Pheasants

One doesn't think of pheasants as roaming wild within the boundaries of the City of New York, but, according to a reader who lives near 244th Street, several were in the winter-bird breadline during the past winter. Furthermore, he reports that bird visitors included robins, bluejays, bluebirds, wrens, flickers and other woodpeckers, blackbirds, kinglets, song sparrows, catbirds, cardinals and others—all in New York City.

Sells 19 Features In Six Months

"I have sold, up to date, nineteen features to the Detroit Free Press and have been made their correspondent here," writes Mrs. Leonard Sanders of 218 Union St., Milford, Mich., on completing the N. I. A. course. Her skilful handling of feature stories was the reason given by the editor for her appointment. Mrs. Sanders' first feature was sold less than four months after she enrolled with N. I. A.

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Indoors and Out

By HOWARD ZAHNISER

THOSE who go to lakes, rivers, mountains, or beaches in August, and most of those whose fortunes are so ill that it would be futile to plan such a journey—in fact, what must be a great majority of us modern human beings surely agree on two things: Those parts of the earth that we think of when we say "Nature" have influences that are good in many subtle ways—tonic, exhilarating, restful, or conducive to the enrichment of contemplation, depending on one's moods or the effects of the previous months of servitude. But, furthermore, the efficacy of these influences is in proportion to the degree that we ourselves respect their sources, stand in awe, and alter them not. When September returns us to that state of living that we are pleased to call civilization, there is a similar agreement that the least unpleasant return is by those who live where some life that is wild can continue to spice each day's duties and each evening's rest.

Some men have perceived this human dependence on natural influences so clearly that the perception has come like a call to some sort of evangelism. "Heaven knows," John Muir testified, "that John Baptist was not more eager to get all his fellow sinners into the Jordan than I to baptize all of mine in the beauty of God's mountains." Muir declared that he cared to live "only to entice people to look at Nature's loveliness," and once he even confided to his journal the suggestion of legally compulsory recreation! Nothing in all his long, intimate, and arduous associations with the wilderness seemed to temper his enthusiasm. "Exhilarated by the divine wildness that imbued mountain and sky, I could not help shouting as I bounded down the topmost curves of the canyon." It is not surprising that the voice of this modern John crying in the wilderness should arouse such a following that his centennial requires more than the remembrances of a day or a month. When John Muir could no longer bound down the canyons he wrote his gospels and crusaded for the preservation of the wild areas for the sake of other men—and also, I surmise, for their own sake. This whole year is John Muir's centennial, and rightly so, and even that should serve only to enliven a lasting remembrance of him.

The same high regard for living things, for unsullied wildness, and unseen places that distinguished John Muir was also the portion of Edward Wilson, the English doctor who perished with Scott on the way back from the South Pole. This was a man who could face the Antarctic and go again, who could conduct an intensive scientific study of grouse disease, who could catch in color and black-and-white the artistic aspects of life, and a man who once awoke in tears, eyes streaming, and sobbing aloud after dreaming of the destruction of flowers. As he confided to his diary: "I could weep still for the bitter sorrow. . . . I was running home from Crippetts Wood where I had left a crowd of people, just picking or just going to pick and trample over the glorious beds of flowers, and no one saw how awful it was to me. . . . I so loved the flowers and the grasses that I would have done anything to save them, to show the people how perfect they were and get them to leave them; but they couldn't understand my tears."

The writings of both John Muir and Edward Wilson reveal a tenderness toward all life. After killing a rattlesnake "that was tranquilly sunning himself in coiled ease about a bunch of grass," John Muir was constrained to write: "He defended himself bravely, and I ought to have been bitten. He was innocent and deserved life." And with rare eloquence Wilson once wrote in a letter: "I do love the Hawks and the Owls, more than any birds, except perhaps the migrant Warblers. I always hope and believe we shall be allowed to see all these things afterwards, and things we never can see now; we shall see all God's works and how they all fit in: I can't think that any interest in them now can only be for these days; some day we shall see it all, and understand it all, you and I—both of us, and everybody else who has felt what it is to love anything into which God has put life, and God made nothing dead. There is only less life in a stone than in a bud, and both have life of their own, and both took their life from God. Yet a bird gives me better ideas than stone, and you give me better ideas than many birds or sunsets or anything else; but mass them all together and one gets a very good idea of God, or the life that God gives us which is love, real Love, from the things that God has made."

Similar pleas for restraint in changing areas that still are what we call natural, and the same expansive sympathy for all creatures, are in the current writings of Kenneth Williamson and Llewellyn Powys, though their references to God are less direct and not to a personified deity.

"One of a race that has fought and wrangled from time immemorial over the way in which it shall worship," Mr. Williamson contemplates a struggle in the air between a house-martin and a sparrow hawk, which he calls Nisus, and then writes: "I love all birds, because they are life, and I love Nisus neither more nor less than this unknown martin. . . . Nature is not merely a hobby and a study: she is something far greater and exquisitely precious,—a spiritual thing, truth, and beauty, and right! And however cruel and callous her mood, these things cannot be altered: they are there, ingrained in the soul, until life shall end, as someday life must. If I have a religion, it is this: God and Nature are but words, and their spirit and meaning are the same. This fight was Nature's business, and I felt that morally and spiritually I had absolutely no right to interfere."

Similarly Mr. Powys writes: "Until we are satisfied with the plain miracle of life, (Continued on page 448)

"AS IF A FLEXIBLE, INVISIBLE WALL HAD BEEN FLUNG ACROSS HER PATH SHE FOUND HERSELF HALTED. . . ."